AGRICULTURAL APPARATUS

CATALOGUE X

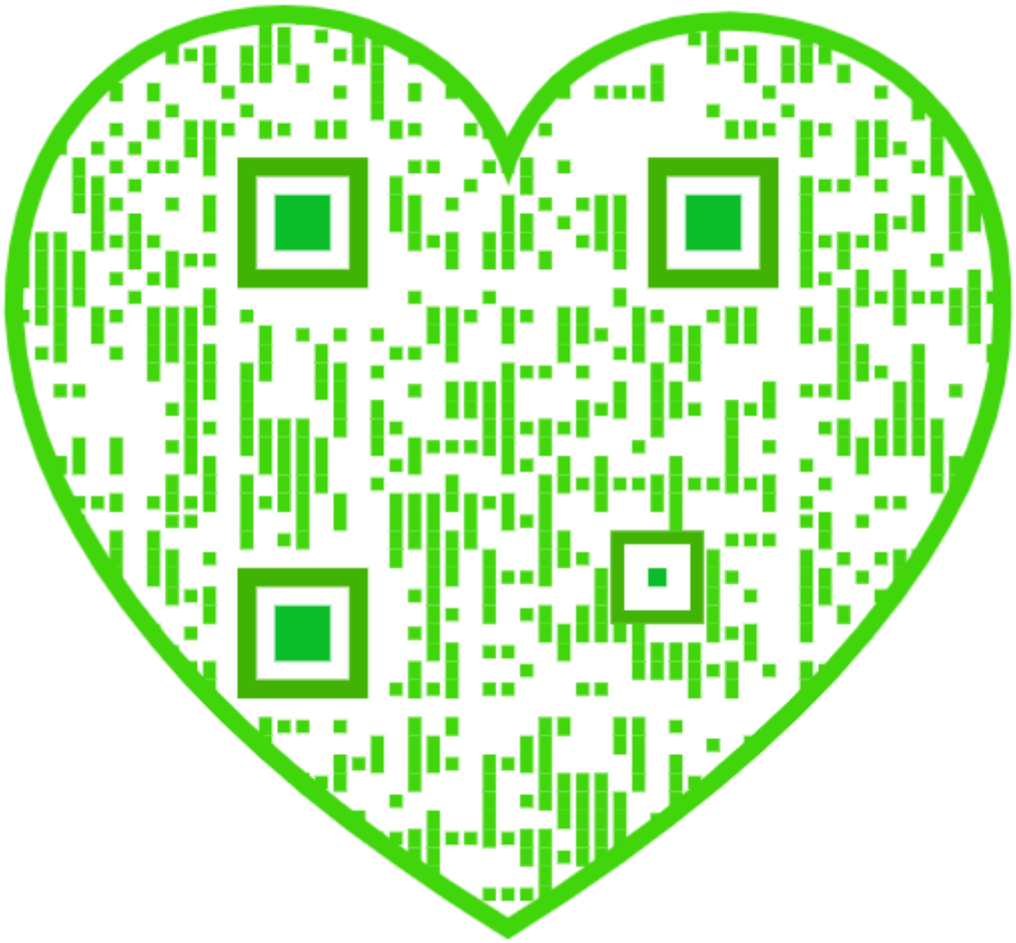
MANUFACTURED AND IMPORTED BY

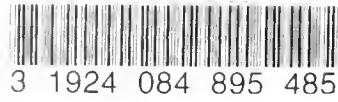
CENTRAL SCIENTIFIC COMPANY

CHICAGO ILL.

SEPTEMBER 1914

"At the head of all the sciences and arts, at the head of civilization and progress, stands—not militarism, the science that kills, not commerce, the art that accumulates wealth—but AGRICULTURE, the mother of all industry, and the maintainer of human life."—*Garfield.*




3 1924 084 895 485

The original of this book is in
the Cornell University Library.

There are no known copyright restrictions in
the United States on the use of the text.

http://www.archive.org/details/cu31924084895485

AGRICULTURAL APPARATUS

MANUFACTURED AND IMPORTED BY

CENTRAL SCIENTIFIC CO.

412 to 420 Orleans Street,

CHICAGO

U. S. A.

SEPTEMBER, 1914

REPRINTED, JUNE, 1915

ALBERT R. MANN LIBRARY AT CORNELL UNIVERSITY

A. H. McCONNELL, Pres.
H. C. ARMS, Vice-Pres.
J. M. ROBERTS, Secy.
A. H. STANDISH, Treas.

Established 1889

Incorporated 1900

CATALOG X

Copyright 1915 by
Central Scientific Company

Notice to the Trade.

Special notice is given to the trade that this catalog is copyrighted, and that unauthorized reproduction of new cuts or illustrations therefrom constitutes actionable infringement of our rights.

We shall use every legal means to protect our work and property from such piracy.

CENTRAL SCIENTIFIC COMPANY.

TO SCIENCE TEACHERS

We take great pleasure in presenting this new edition of our catalog of Agricultural Apparatus. Those who are familiar with the former editions will find that many changes have been made, both in the form of the catalog, and in the many additions to our line of apparatus which have been made. Since the first edition of this catalog was issued in June, 1910, we have made frequent revisions, in order to keep abreast of the progress being made in the study of Agriculture. We feel, however, that this edition marks a distinct advance over any former issue, and we hope that it may meet with hearty approval.

In the design and manufacture of apparatus for the Agricultural Class Room and Laboratory, we have had the benefit of the advice, suggestions and assistance of the U. S. Department of Agriculture (Bureau of Soils), Washington, D. C., and of many prominent agriculturists in such institutions as the Iowa State College of Agriculture and Mechanic Arts, and the Colleges of Agriculture of the University of California, Cornell University, University of Illinois, University of Minnesota, University of Nebraska, Ohio State University, Purdue University, University of Wisconsin and others.

In June, 1910, we purchased the business of W. H. Bowman of Dover, N. H., including stock, patents and good will. The reception of Mr. Bowman's designs has been encouraging, and we wish to assure our patrons of efficient service in the manufacture of this apparatus.

Suggestions regarding improvements in our apparatus and the making of new and useful instruments are desired at all times, and we shall be more than glad to confer with teachers who have any such suggestions to make.

Apparatus manufactured and sold by us which is not described herein will be found in our other catalogs listed below. These will be sent free of charge on request.

Catalog M.....Physics and Chemistry
Catalog K.....College and University Physics
Catalog N.....Biology
Catalog P.....Physiography
Catalog Q.....Lantern Slides
Catalog R.....Chemicals

CENTRAL SCIENTIFIC COMPANY.

TO OUR CUSTOMERS

We are desirous of avoiding mistakes and misunderstandings in our dealings and, therefore, make the following suggestions, the careful observance of which will be to our mutual advantage.

Former editions, if used, will cause you and us much inconvenience and possible annoyance, to avoid which we ask you to **destroy all former editions of our Catalog X.**

CORRESPONDENCE should plainly indicate State, Town, name of School and should be officially signed.

CHANGES IN DESIGN.
In order to keep pace with the advancement of science and improved laboratory methods, we often find it necessary to alter the **details of construction** of apparatus from catalog illustration. Where such modification does not meet the approval of the purchaser, he is at liberty to return the apparatus.

SUGGESTIONS regarding improvements in our apparatus and the making of new and useful instruments are desired at all times.

SPECIAL APPARATUS.
We are prepared to build special apparatus to order from original drawings and specifications.

ORDERS and LISTS for QUOTATION.
1. When possible, specify our catalog number, name of article and dimensions. Further specification is not necessary. We furnish conveniently ruled order sheets upon request.

Note: Lists made from catalogs of other dealers will be transposed by us into our own numbers when possible, with our guarantee that the articles will equal in efficiency and quality those originally specified.

2. Specify date when shipment is desired and route and method of shipment, i. e., by express, freight, or parcel post. If goods are to be F. O. B. Chicago, or F. O. B. destination, so specify in order list.

REPAIRS.
Our extensive manufacturing facilities and skilled workmen enable us to repair instruments of any make. Our charge therefor is based upon the actual number of hours consumed. Apparatus for repair or exchange should **be carefully packed and addressed, and should have a separate tag attached,** showing **name and address of owner. Letter of advice should be sent us through the mails.**

SHIPMENTS.
Unless otherwise ordered, shipments are made by us at **once,** by such route as will insure earliest delivery. Large shipments by freight and smaller shipments by express or parcel post, as seems expedient to us.

DISCOUNTS.
Prices herein are subject to a discount of **TEN PER CENT,** except on items marked **NET** or **DUTY FREE;** the latter will be quoted upon application. No cash discount for prepayment allowed.

No charge for boxing and cartage except on orders of $10.00 or less; then a nominal charge will be made if the boxing expense exceeds five per cent of the value of the shipment.

TERMS.
30 days after delivery unless special terms are arranged for.

NOTE—Unless otherwise directed, invoices and statements will be mailed to the person placing the order, **upon whom we rely to O. K. the bills promptly and thus expedite payment.**

REMITTANCES.
Remittances should be in exchange at par in Chicago, as we are obliged to pay exchange upon all private checks, except from a few of the largest cities.

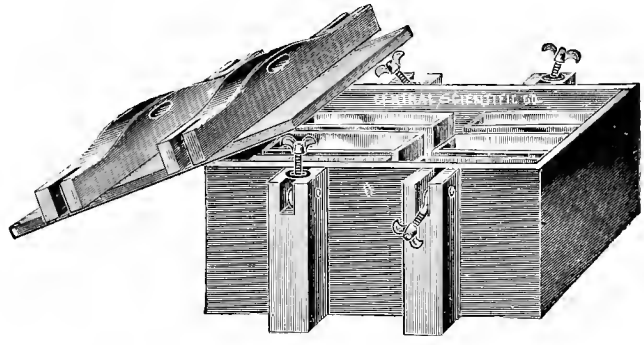
NOTE.—School warrants t... ...ch are not immediately available, should, if possible, be registered bond...

CENTRAL SCIENTIFIC COMPANY.

SOIL ANALYSIS

INCLUDING PHYSICAL PROPERTIES OF SOILS

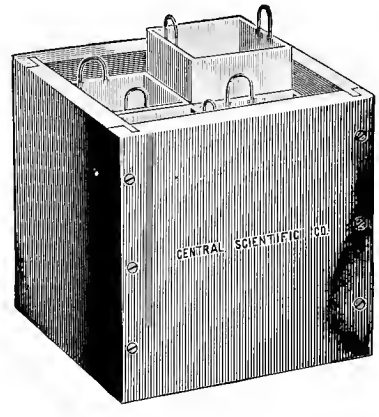
Arranged Alphabetically.



No. 9000.

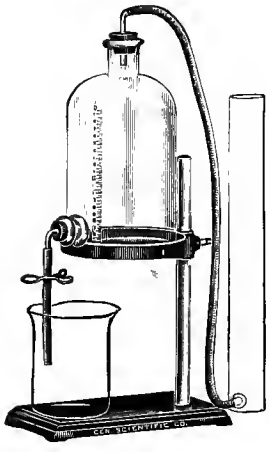
9000. **ABSORPTION APPARATUS, Moisture,** for determining the power of dry soils to absorb hygroscopic moisture from a saturated atmosphere. A water-tight, water-proofed substantial wooden box with heavy cover so designed that it may be clamped air-tight to the box. (A metal box is not satisfactory, because it is so affected by temperature conditions that the results obtained have little or no value.) Wooden strips, not shown in the illustration, support the soil pans and have a device for holding the strips of absorption paper which by capillary action absorb water, keeping the air within the box in a saturated condition. Complete with six soil pans..... $ 15.00

9001. **SOIL PANS** of zinc, 6½ x 6½ x 1⅝ inches, as used in No. 9000 Absorption Apparatus. These pans are water-tight and will be found convenient for use in drying ovens. Each..... .25

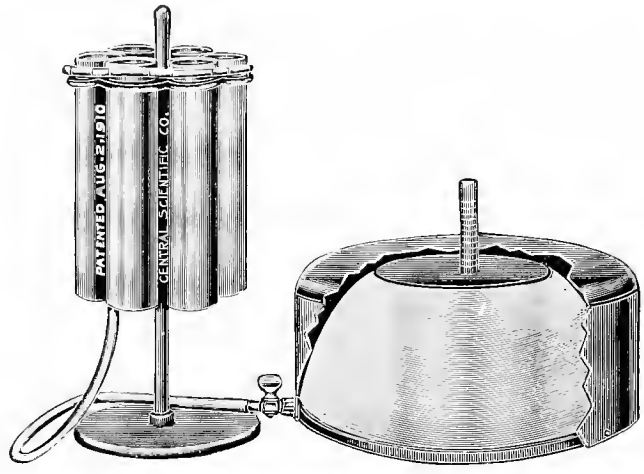


No. 9003.

9003. **ABSORPTION APPARATUS, Heat,** for absorption of heat by soils, as described by Stevenson & Schaub. This apparatus is used to compare the temperatures of various soils at different depths when the soils are exposed to the direct rays of the sun, and consists of four zinc boxes 4 x 4 x 8 inches deep, enclosed in a wooden box open at the top 4.00



No. 9005.



No. 9006 (Shown with Nos. 9288 and 9289).

9005. **ASPIRATOR, McCall.** For studying the rate of the flow of water through soils of different textures. This aspirator has no moving parts to cause errors from friction and the method of operation is exceedingly simple. The bottle is first filled with water to a definite mark on the scale and connections are made as shown in the illustration. The pinch cock is then opened and water allowed to run from the bottle until it stands at a much lower level. By noting the time required with different soils, the relative rate of flow is readily determined. Complete as illustrated, with metal support, but without soil tube or beaker..... $ 5.50

9005A. **SUPPORT** only of No. 9005..... 2.50

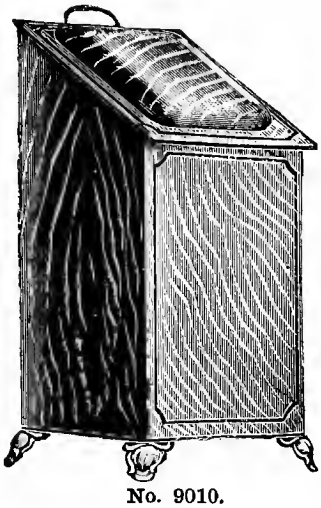
9005B. **ASPIRATOR BOTTLE** only of No. 9005. Complete with rubber stoppers, rubber tubing, and pinch cock..... 3.00

9006. **ASPIRATOR,** for determining the comparative porosity of soils by measuring the rate of flow of air through them under constant pressure. This apparatus consists essentially of a closed pressure chamber formed by a rubber diaphragm or bag placed between a movable weight and a wooden base 15 inches in diameter. To the weight is attached a graduated rod, by reference to which definite quantities of air may be forced through the different soils under consideration. The pressure chamber is enclosed in a suitable casing for protection..... 15.00

For **AUGERS** see pages 24, 25 and 40.

For **BALANCES** see pages 120 to 128.

SOIL BINS AND CONTAINERS

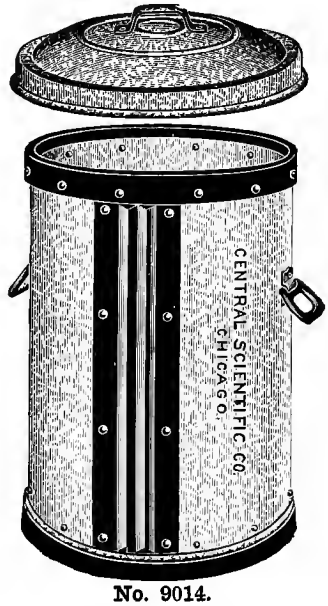


No. 9010.

No. 9011.

9010. **SOIL BIN,** of heavy metal, japanned oak, square front; with removable soil carrier. Size 10½ x 11 x 21 inches. These soil bins will be found much more desirable than bins of wood, presenting a more handsome appearance at only a slight additional cost. Each $ 2.75

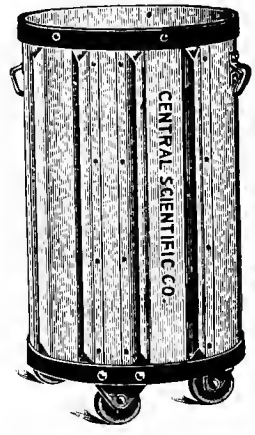
9011. **SOIL BIN,** strongly made of heavy galvanized steel with hinged cover and with angle steel reinforcements and legs, the bottom of the can being 4 inches from the floor. Size 22 inches by 30 inches by 30 inches high.....Net 10.00



No. 9014.

9014. **SOIL CONTAINER,** made of galvanized iron, air and water-tight, with outside fitting cover; has a heavy steel band top and bottom, the lower one riveted through body and bottom; concave bottom raised 1¼ inches from ground; drop handles.

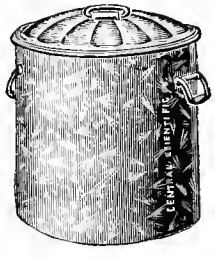
Number.....	2	3	4
Size, inches.....	14½ x 24	16 x 26	19 x 28
Capacity, gallons.....	17	22	32
Price, each, ...Net	2.25	2.50	3.00



No. 9016.

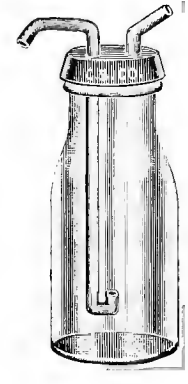
9016. **SOIL CONTAINER**, of galvanized steel fitted with wheels and handles for wheeling about. Very convenient in transporting soils from one part of the laboratory to another. With cover.

Number	13	14
Size, inches	16 x 26	19 x 28
Capacity, gallons	22	32
Price, each, net	$3.50	4.00



No. 9018.

No. 9019.



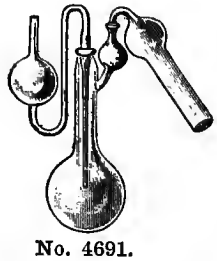
No. 9021.

9018. **SOIL CONTAINER**, of heavy galvanized iron, with handles and cover; will hold half-bushel. Each ..... $ 1.00
For other **SOIL CONTAINERS** see **PANS**, page 22, and **SAMPLE CANS**, page 27.

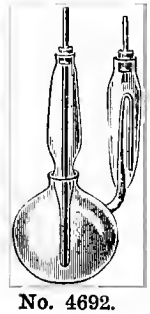
9019. **SCOOP**, of metal, retinned, for use in handling soils; size, 8 by 5½ inches..... .22

9021. **BOTTLE, Mechanical Analysis**, convenient for separating soils into their constituent parts, as described in Mosier and Gustafson's "Soil Physics Laboratory Manual." Complete with inverted rubber stopper and tubes ..... .50

CARBONIC ACID APPARATUS

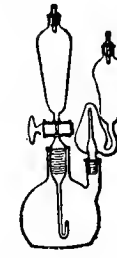


No. 4691.



No. 4692.

No. 4693.



No. 4694.

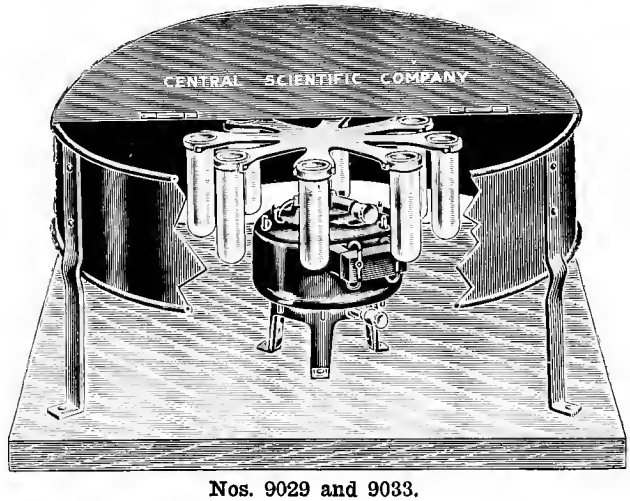
4691. **ALKALIMETER, Bunsen's** ..... $ 1.00

4692. **ALKALIMETER, Geissler's** 1.50

4693. **ALKALIMETER, Schroedter's** 1.65

4694. **ALKALIMETER, Mohr's,** latest form 1.90

4695. **CARBONIC ACID APPARATUS, Knorr's.** (See description and illustration on page 141) .....Net 6.75



Nos. 9029 and 9033.

9029. **CENTRIFUGE, Soil,** for preparing soil samples for Mechanical Analysis. This machine is of excellent design, having features suggested by agronomists. The motor is mounted with shaft vertical, thus obviating considerable vibration and allowing easy access to the soil tubes. A brass trunnion arm, mounted on this shaft, carries eight soil tubes, which are of heavy well annealed glass and are encased in aluminum sheaths. These sheaths are held in trunnions to the trunnion arm by hardened steel bearings. The whole is protected by a metal covering, which extends to the floor or table on which the motor rests, access to motor and tubes being gained by means of a hinged cover.

Complete with ⅛ H. P., 110 volt, 60 cycle, A. C. motor, of 1800 R. P. M. no load speed, ready for mounting on a table top, and eight soil tubes.....Net 75.00

9030. **CENTRIFUGE, Soil,** same as No. 9029, but with ⅛ H. P., 110 volt D. C. motor...Net 70.00

9031. **CENTRIFUGE, Soil,** same as No. 9031, but with 220 volt D. C. motor.....Net 75.00

9032. **EXTRA SOIL TUBE,** heavy glass, as used in Nos. 9029 to 9031..... Net .15

9033. **PLANK BASE,** on which any one of the machines from No. 9029 to No. 9031 may be mounted. Substantially made of hardwood, 36 x 36 x 1¾ inches..... 7.75

9034. **CENTRIFUGE, INTERNATIONAL,** see page 190.

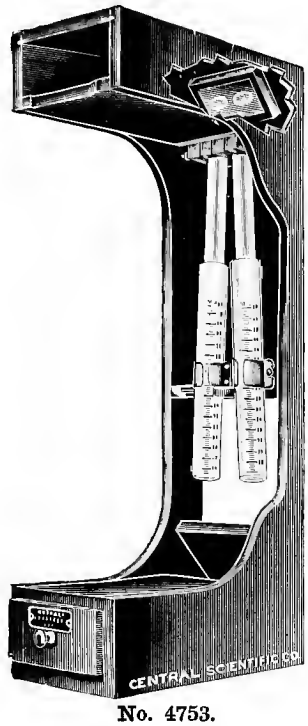
No. 9036.

9036. **CENTRIFUGE, Moisture Equivalent,** Briggs-McLane, as described in the Proceedings of the American Society of Agronomy, Volume 2, 1910.

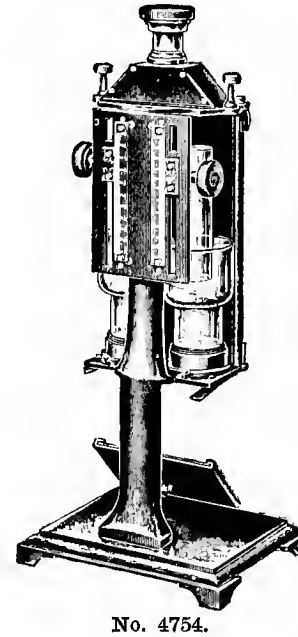
This centrifuge is used for determining the relative moisture equivalents of soils where the term moisture equivalent designates the maximum percentage of moisture which a soil can retain in opposition to a known centrifugal force. For a standard of comparison, a centrifugal force equal to 1,000 times the force of gravity has been adopted. In making the determinations, the soils, suitably moistened, are placed in cups with perforated bottoms. These cups are then placed in the cylinder of the centrifuge and rotated at a constant speed, so chosen as to develop the required centrifugal force. "Each soil now loses water until the capillary forces have increased sufficiently to balance the centrifugal force acting on the soil moisture. Since the moisture content of each soil which has been treated in this way is in capillary equilibrium with the same force, it follows that if these moist soils are placed in contact in any order whatever no movement of water from one soil to another will take place. A condition of complete equilibrium exists throughout the series of soils thus treated." It is then necessary only to determine the moisture content of each soil corresponding to this condition of equilibrium in order to determine its quantitative position in the scale of moisture retentiveness. The centrifuge here described is capable of maintaining the required centrifugal force well within the desired limit of accuracy.

The instrument consists of a bronze disc cylinder containing 16 soil boxes with wire gauze bottoms, and attached to the shaft of a vertically mounted 110 volt D. C. motor. The motor is provided with a Kellogg Constant Speed Governor and a Frahm Tachometer (not shown in the illustration) is supplied which has a range from 2380 to 2500, thus bringing the desired point of speed, 2440 R. P. M., about the middle of the dial. Complete as described..... Net $ 197.00

9037. **CENTRIFUGE, Moisture Equivalent,** Briggs-McLane, same as No. 9036, with 220 volt D. C. motor.....Net 201.00



No. 4753.



No. 4754.

4753. **COLORIMETER,** Schreiner's, as used in the Laboratory of the Bureau of Soils, United States Department of Agriculture. After designs by Oswald Schreiner. All parts of the instrument which come in contact with the solutions are of glass. Broken parts can readily be replaced.

The Colorimeter consists essentially of two graduated glass tubes which contain the standard and the unknown colorimetric solution, with two smaller glass immersion tubes by means of which the column of liquid in the graduated tubes may be changed. These tubes are mounted on the colorimeter stand by an improved method which makes their adjustment exceedingly simple and permits a rapid and easy setting while the comparisons are being made.

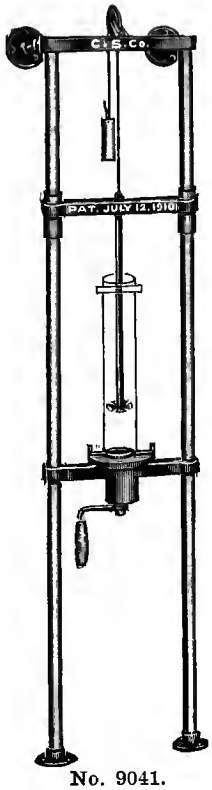
"To make the comparison, the standard colorimetric solution is poured into one of the graduated tubes and put into place in the camera, together with the immersion tube. The unknown colorimetric solution, made up to definite volume, is put into the other graduated tube and similarly placed in the instrument. The tube containing the solution of unknown strength is set at a convenient height, say 40 scale divisions, and the other tube containing the standard moved up and down, the operator watching the effect on the images in the mirror through the opening at the front of the camera. By moving the standard tube so that the image is alternately weaker or stronger than that of the unknown solution the setting can be accurately and quickly made. When both images show the same intensity of color the setting is read by noting the division mark on the graduated tube opposite the ground bottom of the immersion tube." For full description see "Journal of American Chemical Society," Volume XXVII, September 9, 1905, and "Bulletin No. 31, United States Department of Agriculture, Bureau of Soils," from which the above quotation was made. Complete with graduated and plain tubes ..... $ 16.65

4753A. **TUBES, Graduated,** of No. 4753, per pair 3.30

4753B. **TUBES, Immersion,** of No. 4753, per pair ..... .90

4753C. **COLORED GLASSES, Lovibond's Standard,** to fit No. 4753 Colorimeter, each 1.50

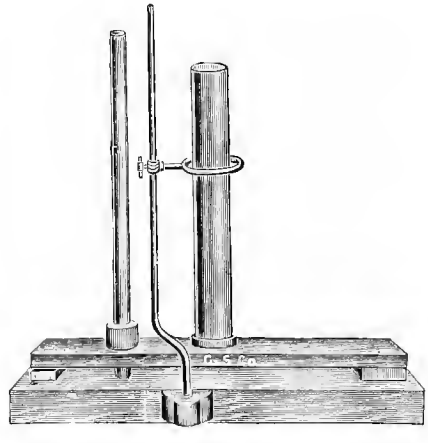
4754. **COLORIMETER, Duboscq's.** For comparison of colors in liquids. The observations are made by means of a monocular telescope which gives a circular divided field, thus eliminating the errors due to the difference of vision between the two eyes of the operator. The adjustment of colors is obtained by means of a rack and pinion which immerses the glass cylinders more or less in the liquids, the movement being registered upon a scale ..... Duty Free 50.00



No. 9041.

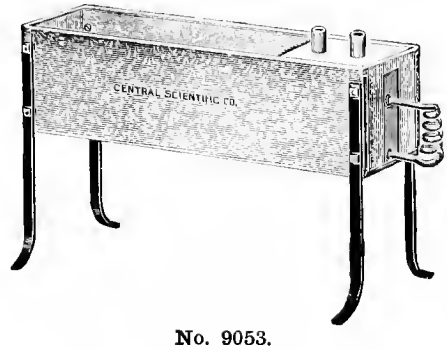
9041. **COMPACTING MACHINE,** designed for obtaining uniform compaction of soils in tubes 18 inches or less in length and 4 inches or less in diameter. It consists of two uprights having sockets at their lower ends for attachment to the floor and a cross bar with wall attachments at their upper ends. A cross bar fastened rigidly to these uprights carries a rotating tube socket or holder which is rotated by means of a crank. Twice during each revolution the tube is raised to the height of ¼ inch by means of inclined surfaces under the tube holder, and automatically dropped, which process jars the soil into position. A small "propeller" is attached to the end of the rod extending down from the sliding cross bar. This "propeller" is placed at the bottom of the tube to be filled and soil then poured into the tube. Twice during each revolution it drops with the soil tube, thus striking a definite number of blows on the soil column as it rises.

This compactor is built to compact soils to approximately the same condition in which they are found in the fields and to give uniform compaction for comparative tests. It is simple in principle and does its work quickly and easily. With two propellers (one for 2-inch tubes and the other for 4-inch tubes) weight holder, and weights. $ 25.00



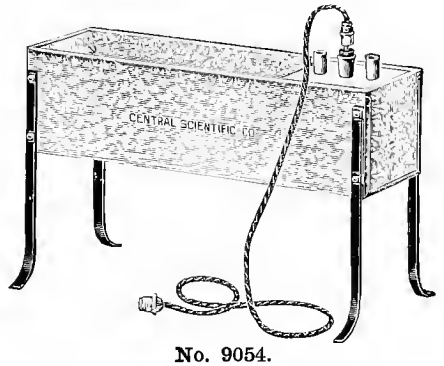
No. 9042.

9042. **COMPACTOR, Spring Board,** necessary for compacting soils in glass tubes. Base of wood 8 x 24 inches; spring board firmly fastened to base at one end; massive slip-weight slides on nickel-plated rod. A very substantial and well-finished piece..... 5.00



No. 9053.

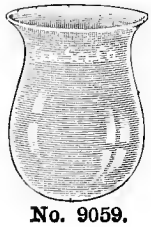
9053. **CONDUCTIVITY APPARATUS,** for determining the thermal conductivity of soils. This design has been modified from the original design in use at the University of Illinois Soils Laboratory. A galvanized iron soil tray, 16 x 4 x 5 inches, has at one end a water-tight boiling tank, 4 x 4 x 5 inches. Attached to this tank is a heating coil, as shown in the illustration, by which the water in the tank can be kept at the boiling point indefinitely. By this method of heating, the errors present in the old apparatus due to direct heating from the flame are entirely avoided. The boiling tank is provided with tubulatures for thermometer, and for reflux condenser which may be used if desired. Complete as illustrated ..... $ 5.00



No. 9054.

9054. **CONDUCTIVITY APPARATUS.** Similar to No. 9053, but without heating coil and with an electrical heating unit. This method of heating was suggested by the Department of Soil Technology of the New York State College of Agriculture at Cornell University and has proved very satisfactory. For 110 volt current, either direct or alternating 9.00

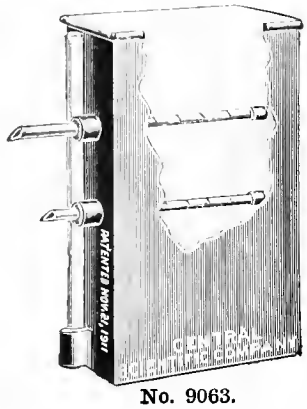
For **CONDUCTIVITY BRIDGE** see page 32.



No. 9059.

9059. **DIGESTION CUPS,** porcelain, for acid digestion of soils (Hilgard's Method).

Number	1	2
Capacity, c.c.	50	90
Each, ... Net	.35	.40



No. 9063.

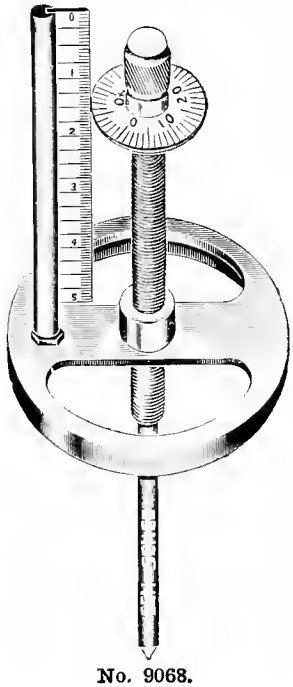
No. 9065.

9063. **DRAINAGE and WATER TABLE APPARATUS, Graham & McCall's,** designed to show the behavior of capillary and free water in the soil, and the principles involved in the proper construction of a barnyard to prevent loss of plant food; of copper, 3 x 6 x 12 inches high, with a solid bottom to represent hard clay or stone. Through the vessel are two brass tubes, sawed transversely, which communicate with the outside, representing tile drains at different depths. A standpipe shows the height of free water inside the vessel.

To operate, fill the vessel with soil and pour on water at regular intervals, giving it time to soak into the soil. The water, instead of coming out at the tubes, will pass downward through the soil until the solid bottom is reached, when a water-table of free water will be formed at a height indicated by the free water in the glass standpipe. When the free water has risen to the first opening it will pass outside the vessel, thus proving that a tile drain placed as low as soil conditions will permit removes free water before one placed not so deep.

Some Things Which the Apparatus Will Show:

Tile drains do not remove capillary water. A deep drain removes the first water.
No water is removed until the soil at the drain line is beyond the point of saturation.
The volume of soil available for plant food is greater in a drained soil.
The volume of soil retaining capillary water is greater where the drains are deep.
Plant food would not be wasted by leaching from a barnyard having a tight floor of clay or cement and some kind of retaining wall around the outside..... $ 5.00



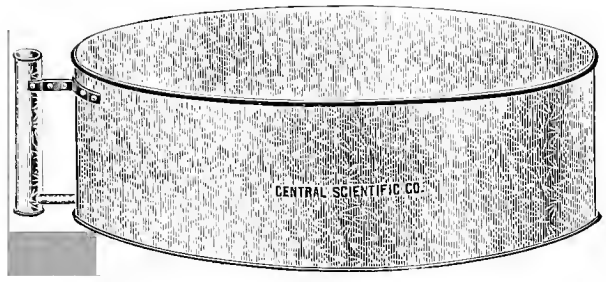
No. 9068.

For **DRYING OVENS,** see pages 157 to 161.

9065. **ELUTRIATING FLASK, Benningsen's.** The bulb has a capacity of about 400 c.c., and the neck is graduated to 40 c.c. in 1 c.c. divisions..... 1.25

9068. **EVAPORATION GAUGE,** micrometer screw form, for measuring rate of evaporation, as described in Bigelow's "Manual for Observers in Climatology and Evaporation" (U. S. Weather Bureau No. 409). A micrometer screw is mounted on a cap suitable for supporting it on the top of a still well 3 inches in diameter. The screw proper is 5 inches long with 20 threads to the inch. The micrometer head is graduated in 50 divisions so that readings may be taken to 1/1000 of an inch. For convenience in reading a linear scale graduated in 20ths of inches is provided. The total distance from the head to the end of the pointer, which is of incorrodible material, is 12 inches. The pointer may be unscrewed and a hook screwed in its place, thus making the instrument serve as a hook gauge. Complete as described, with pointer and hook..... 10.00

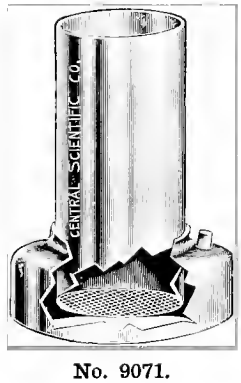
For **EVAPORATION TANK,** see next page.



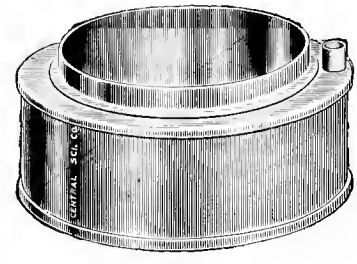
No. 9069.

9069. **EVAPORATION TANK**, for use with No. 9068 Evaporation Gauge, of heavy galvanized iron 6 feet in diameter by 2 feet deep. A still well 3 inches in diameter is firmly attached to one side of the tank and connected with the tank at the bottom by a galvanized pipe of sufficient size to allow free flow of water between the tank and still well..... $ 25.00

Note—Tanks of different dimensions can be furnished if desired.



No. 9071.



No. 9073.

9071. **EVAPORIMETER**, for determining the amount of water evaporated from the surface of various soils in a given time; for determining the effect on evaporation produced by different fertilizers, and different methods of cultivation. It consists of a brass tube 4 inches in diameter and 9 inches long having a perforated metal bottom to allow free ingress of water. This tube fits into a water-tight spun brass base.

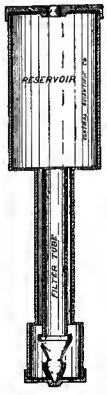
In operation the tube is filled with soil which is compacted by means of the Soil Compacting Machine (No. 9041). It is then placed in position in the base. Water of known weight is placed in the base whence it passes through the perforated bottom of the tube to the soil and is evaporated from its surface.

The apparatus is entirely of brass, durably made, highly polished and lacquered.... 3.35

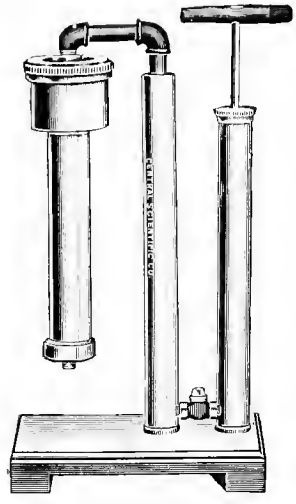
9072. **EVAPORIMETER.** Same as No. 9071, but with brass tube 18 inches long..... 4.25

9073. **EVAPORIMETER**, for finding the co-efficient of evaporation from soils. The soil container is of copper with brass bottom perforated with 1 millimeter circular openings. This container is placed in a copper water jacket 3 x 8 inches..... 2.25

No. 9078.



No. 9078.
(Cross-section.)

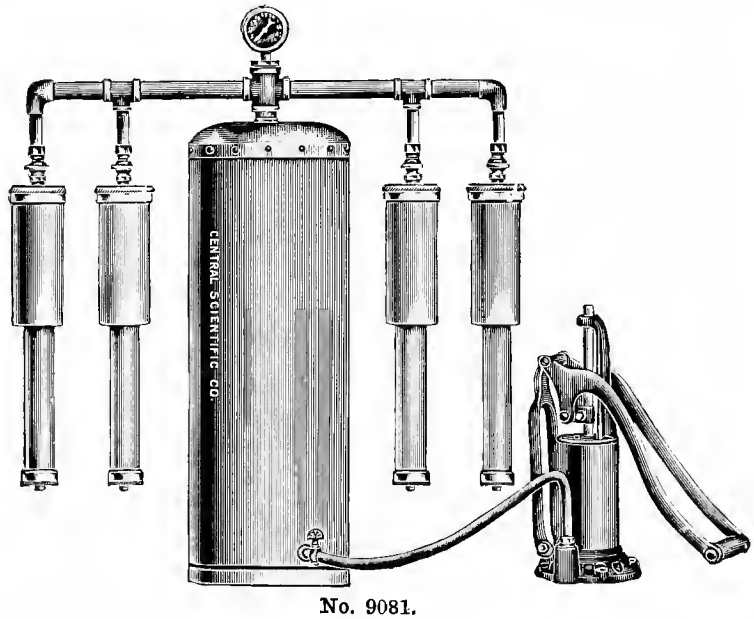


No. 9080.

9078. **FILTER, Briggs' Design,** for the filtration of soil solutions, as described in Bulletin No. 31 of the Bureau of Soils. Made of brass, nickel plated outside, silver plated inside, and therefore especially suited for plant culture experiments. Capacity of reservoir approximately 800 c. c. Complete with Pasteur-Chamberland Filter Tube.. $ 10.00

9079. **FILTER, Briggs' Design,** similar to No. 9078, but of iron, porcelain lined. Capacity of reservoir approximately 750 c. c. Complete with Pasteur-Chamberland Filter Tube 8.35

9080. **FILTER AND PUMP, Briggs' Design,** for field use. Consists of a filter similar to No. 9078, but having a reservoir of only 250 c. c. capacity. Mounted on a base with a compression pump and air tank. Complete as shown in the illustration..... 16.65

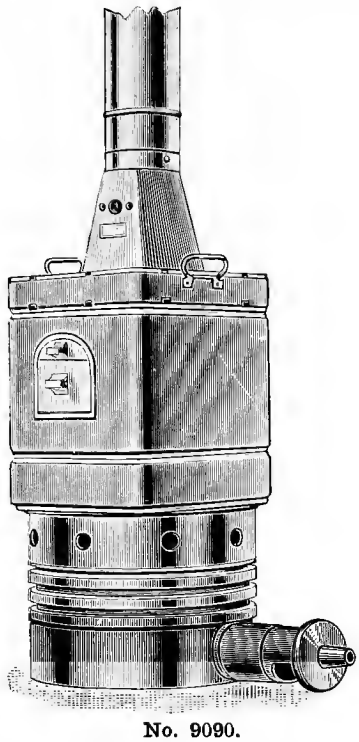


No. 9081.

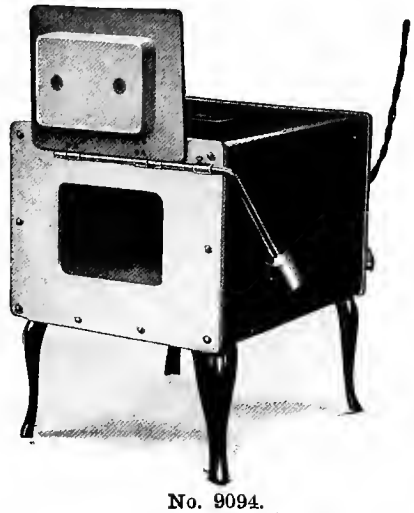
9081. **FILTER FIELD SET.** Consists of an air reservoir of 10 gallons capacity, with pressure gauge and four No. 9078 filters mounted as shown in the illustration. Complete with special compression pump..... 75.00

9082. **FILTER FIELD SET.** Same as No. 9081, but with four No. 9079 filters..... 68.00

9083. **FILTER TUBE, Pasteur-Chamberland,** French make, for use with any of the above filters ..... Net 2.00



No. 9090.



No. 9094.

9090. **FURNACE, Muffle,** for all work where exact temperatures are desired not exceeding the fusing point of copper. May be operated with illuminating gas, natural gas, or gasoline gas without alteration. Complete with muffle, dome, crucible tongs and 6 feet of chimney pipe and burner. Inside muffle space 3 x 4 x 2⅜ inches high; requires ½ inch clear bore gas pipe and tap; clay parts 7¾ x 7¾ x 8 inches high; inside space 5¼ x 5¾ x 5¼ inches high. Height from table to top of lid, 16 inches.....Net $ 17.00

9091. **FURNACE, Muffle.** Same as No. 9090, but inside muffle space 3⅞ x 5⅞ x 3 inches high; requires ¾-inch clear bore gas pipe and tap; clay parts 10 x 9 x 11 inches high; inside space 7½ x 6½ x 5¾ inches high; height from table to top of lid 19½ inches.....Net 22.00

9092. **FURNACE, Muffle.** Same as No. 9090, but inside muffle space 4⅞ x 6⅝ x 4 inches high; requires 1-inch clear bore gas pipe and tap; clay parts 11¾ x 10¾ x 14 inches high; inside space 8¾ x 7¾ x 6¾ inches high; height from table to top of lid 23 inches.Net 35.00

MUFFLES for above furnaces:

Number.....	9090A.	9091A.	9092A.
Each.....Net	1.25	1.50	1.75

9094. **FURNACE, Electric Muffle,** with heating element of nickel chromium wire. This wire is wound on an alundum muffle which is surrounded by a packing of special heat-insulating material enclosed in a sheet-iron case. Dimensions of chamber 3⅛ inches wide by 2½ inches high by 5 inches long. Maximum working temperature 1000° C.; for 110 volt direct or alternating currents. Consumes 800 watts. Accurate temperature regulation is accomplished by means of a rheostat which is the only auxiliary apparatus required. This furnace is useful for ash determinations, ignition of precipitates, incinerations, fusions, combustions, enameling, hardening and annealing small parts, melting alloys and metals, etc. Complete with rheostat.....Net 43.00

9094A. **FURNACE, Electric Muffle.** Same as No. 9094, but without rheostat.....Net 35.00

9095. **FURNACE, Electric Muffle.** Same as No. 9094, but with power consumption of 1250 watts and chamber dimensions 4¼ inches wide by 3 inches high by 8 inches long. Complete with rheostat.....Net 60.00

9095A. **FURNACE, Electric Muffle.** Same as No. 9095, but without rheostat.....Net 50.00

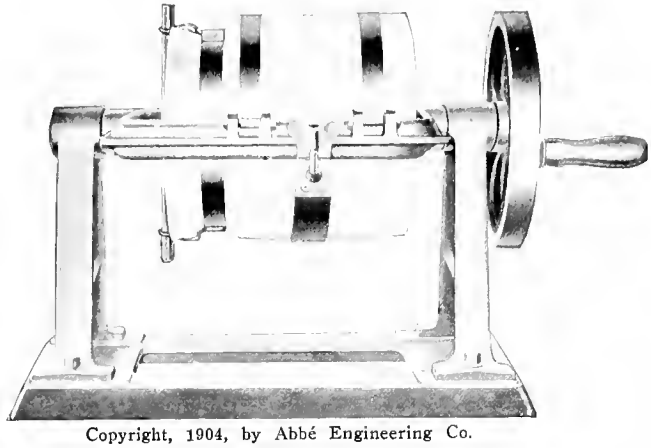
9096. **FURNACE, Electric Muffle.** Same as No. 9094, but with power consumption of 2400 watts and chamber dimensions of 5¼ inches wide by 3¾ inches high by 9 inches long. Complete with rheostat.....Net 85.00

9096A. **FURNACE, Electric Muffle.** Same as No. 9096, but without rheostat.....Net 65.00

9097. **FURNACE, Electric Muffle.** Same as No. 9094, but with power consumption of 4150 watts and chamber dimensions of 7¼ inches wide by 5¼ inches high by 11 inchos long. Complete with rheostat.....Net 110.00

9097A. **FURNACE, Electric Muffle.** Same as No. 9097, but without rheostat.....Net 80.00

NOTE.—Furnaces of the above type can be furnished in other voltages up to 250.



Copyright, 1904, by Abbé Engineering Co.

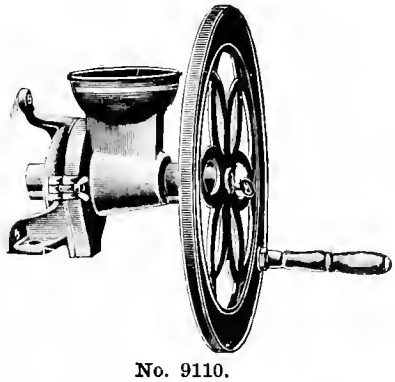
No. 9100.

For **MICROSCOPES** see pages 154 to 156.

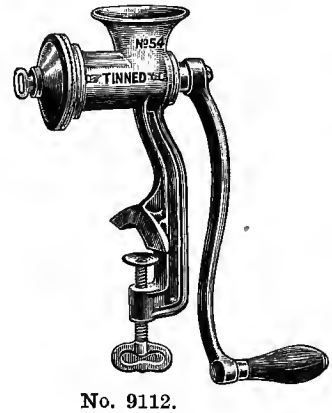
9100. **MILL, Ball,** for grinding to an impalpable powder any materials either hard or soft, particularly those which must not come in contact with metal. Balls of porcelain are used in a porcelain drum, which is tightly closed by a clamped lid. With jar 8.75 by 9.65 inches, which will handle from a few ounces up to 5 pounds; requires a floor space 10½ by 25 inches. Complete as illustrated, for hand power.....Net $ 30.00

9102. **MILL, Ball,** same as No. 9100, but with pulley for power.....Net 35.00

9104. **BALLS, Porcelain.** Per pound..... .25



No. 9110.

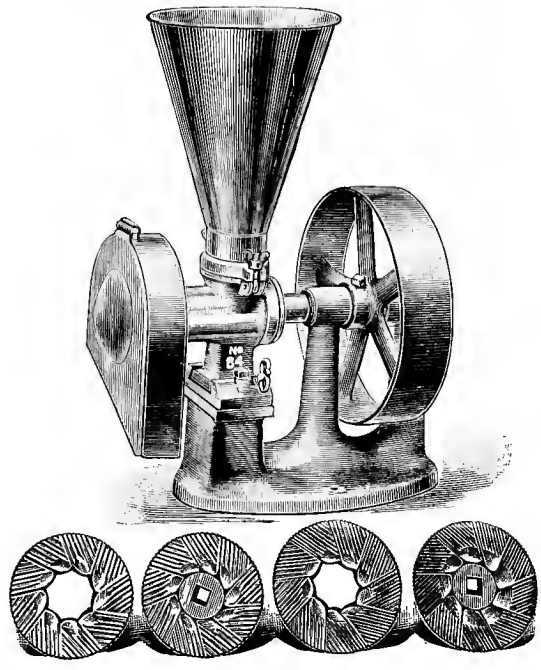


No. 9112.

9110. **MILL, Grinding and Pulverizing,** for pulverizing soils ready for sifting. Will also grind dry bones, corn, rock phosphates, etc. Height 11 inches, length 12 inches, width 9 inches, dimensions of throat 3 x 2 inches, wheel 19 inches diameter, weight 47½ lbs. Compact, strong and durable..... 7.5(

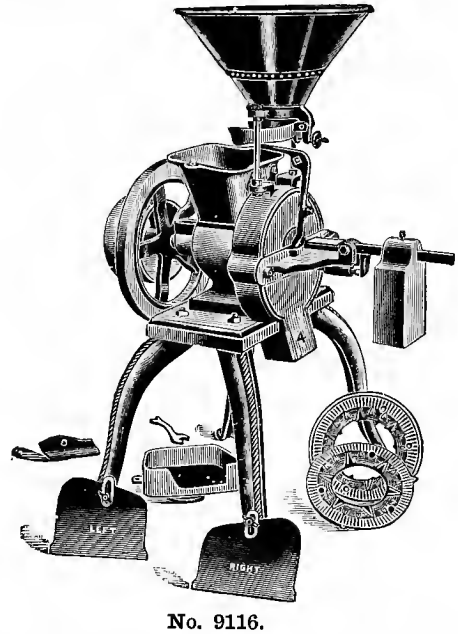
This Mill can be furnished for power fitted with 12 x 3 inch single pulley for $5.00 extra, or with double pulley for $10.00 extra.

9112. **MILL, Grinding and Pulverizing,** suitable for grinding soils, grains, coal, dry bone, limestone, etc. Will pulverize limestone fine enough to pass through 100-mesh sieve. Three sets of grinding discs, coarse, medium and fine. Total weight, 24 pounds..... 7.5(



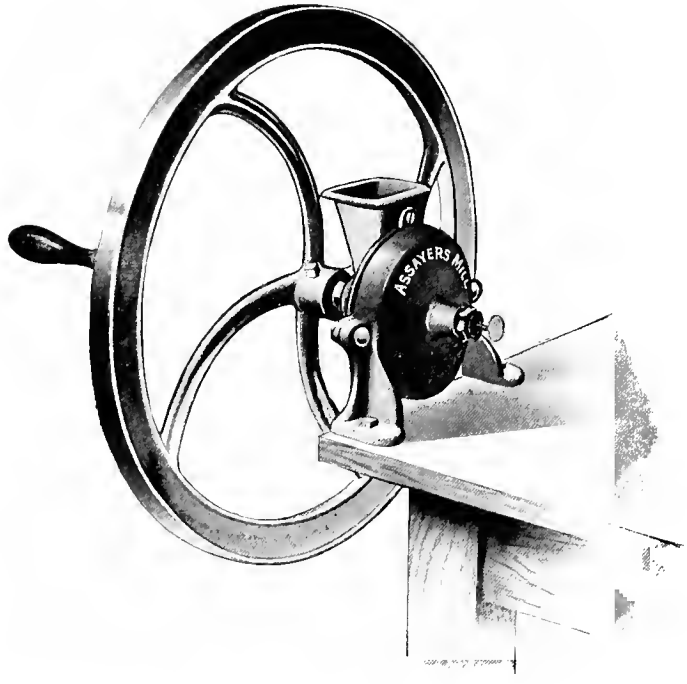
No. 9114.

9114. **MILL, Grinding and Pulverizing,** same as No. 9112, but larger and for power drive. Weight 65½ pounds, height 24 inches, length 12 inches. Pulley 12 inches by 2¾ inches, speed of pulley 300 R. P. M. Power required 2 to 3 H. P..... $ 50.00



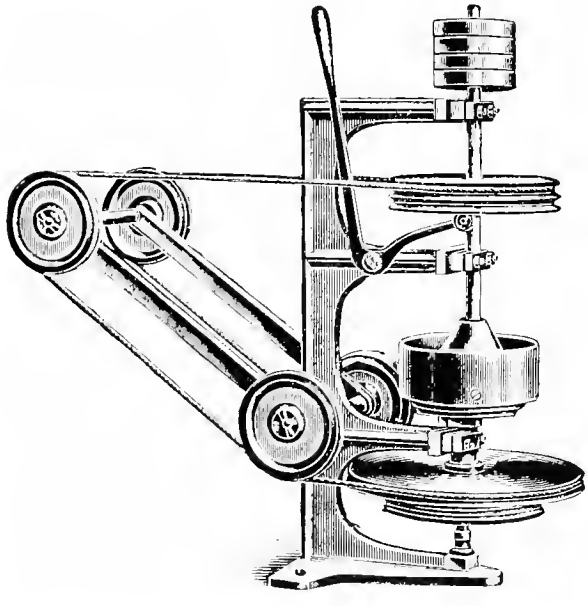
No. 9116.

9116. **MILL, Grinding and Pulverizing,** with automatic feed, adapted for grinding soils, coal, sand, gravel, stones, grit, etc., etc. Will take large material and run either way, to the right or left. The automatic feed is used for small material, while larger pieces are fed directly into the mill. Pulley 8 inch diameter for 4 inch belt; speed 600 to 1000 R. P. M. Weight 420 pounds; height 3 feet 10 inches; floor space 23x29 inches; **distance from floor to shaft, 24 inches**..... 60.00



No. 9117.

9117. **MILL, Grinding and Pulverizing,** made especially for pulverizing hard substances. Will take in material the size of shellbarks. The grinding surfaces are made of very hard material. Hand wheel, 20 inch diameter; weight complete, 22 pounds....Net $ 9.00



No. 9119.

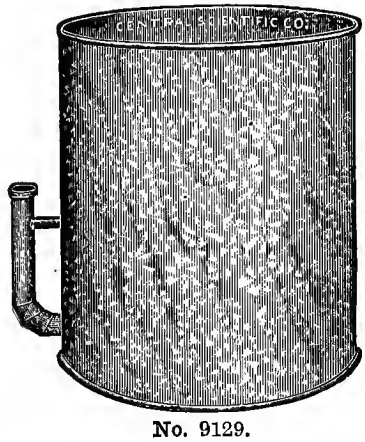
9118. **MILL, Grinding and Pulverizing, Merker's.** (Recommended by Wiley in his "Principles and Practice of Agricultural Analysis," Vol. 3, Page 4.)

A very efficient Mill for grinding coarsely shredded fodder, hay, and straw, to a fine state. The burrs consist of a cast steel rotating mortar, 15 cm. diameter, with a ribbed bottom and a pestle 8.5 cm. diameter, fixed with wheel attachment to produce rotary movement of the pestle in an opposite direction to that of the mortar.

Complete for hand power. Duty free $100.00

9119. **MILL, Grinding and Pulverizing, Merker's,** same as No. 9118, but equipped for belt power. Duty free $80.00

No. 9125.



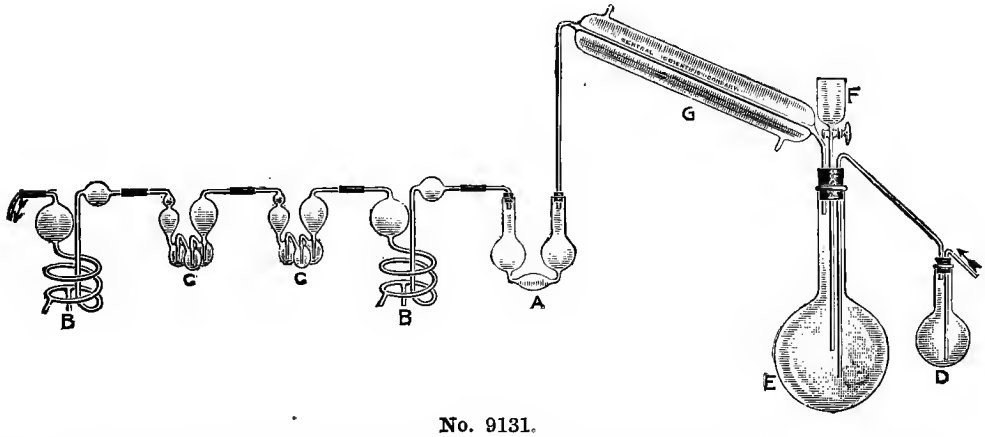
No. 9129.

9125. **MULCH CYLINDER, McCall's,** for determining the effect of mulches upon the rate of evaporation from soils. Design as illustrated; of galvanized iron, 19 inches high; approximate diameter at top 4 inches; at bottom 8 inches ..... $ 2.00

9127. **MULCH CYLINDER, McCall's.** Same as above, but 29 inches high 2.25

9129. **MULCH CYLINDER, Stevenson & Schaub's.** Of galvanized iron 11 inches diameter by 13 inches high, with water supply tube 1.25

For **NITROGEN DETERMINATION APPARATUS** see pages 41 to 43.



No. 9131.

9131. **ORGANIC MATTER DETERMINATION APPARATUS,** for determination of organic matter in soils by the wet combustion method (Bulletin No. 24, Bureau of Soils). Consists of two flasks, two Mohr-Geissler Potash Bulbs, one Peligot Tube, two Winkler's Spiral Potash Bulbs, Condenser, Dropping Funnel, rubber stoppers and connecting tubes 8.35

9131A. **POTASH TUBE, Peligot** ..... .40

9131B. **POTASH BULB, Winkler's** 1.10

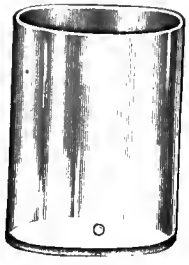
5174. **POTASH BULB, Mohr-Geissler** (C in illustration) ..... .75

9131D. **FLASK, Potassium Hydrate** (Same as No. 4902 Flask, 6 oz.) ..... .10

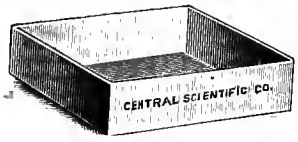
9131E. **FLASK, Round Bottom** (Same as No. 4902 Flask, 12 oz.) ..... .14

9131F. **FUNNEL, Separatory** (Same as No. 4924 Funnel, 50 c.c.) ..... .84

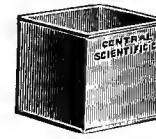
9131G. **CONDENSER** (Same as No. 4773 Condenser, 15 in.) ..... .95



No. 9132.



No. 9135.



No. 9137.

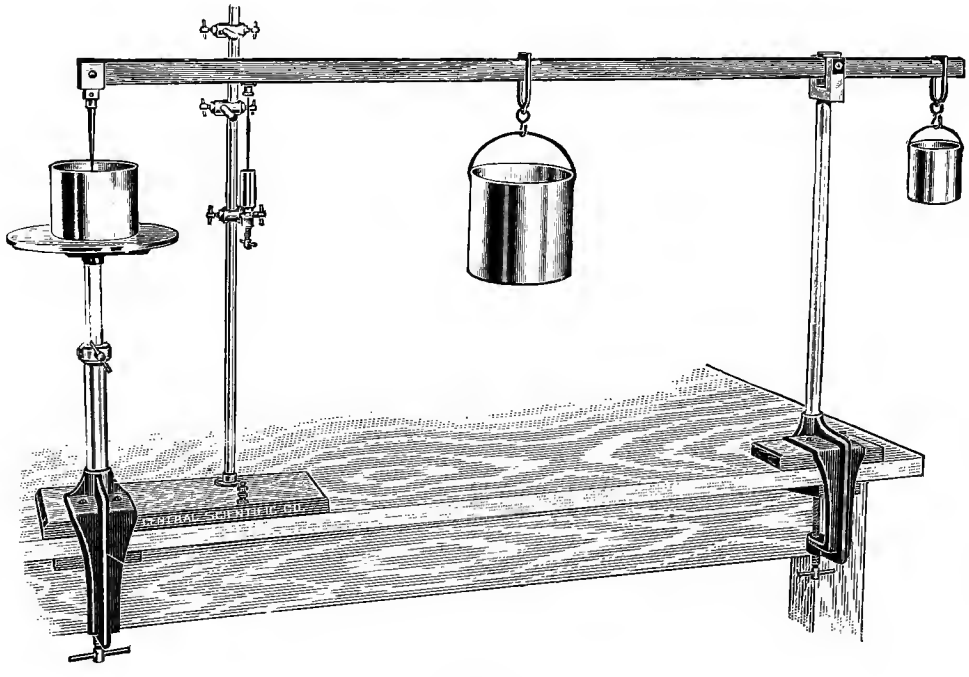
9132. **ORGANIC MATTER JAR.** A 1-gallon glass jar provided with a round hole for drainage 1 cm. in diameter, located 1 cm. above the bottom..... $ 0.45

9135. **PAN,** of metal, water tight, 4¼ x 4¼ x 1½ inches. For use in Drying Ovens. Each .20

9001. **PAN,** of zinc, 6½ x 6½ x 1⅝ in., as used in No. 9000 Absorption Apparatus. These pans are water tight and will be found convenient for use in drying ovens. Each. .25

9137. **PAN** or **BOX,** of zinc, 4 x 4 x 4 inches, for volume-weight experiments. Each..... .40

For **SAMPLE CANS** or **BOXES,** see page 27.



No. 9139.

9139. **PENETROMETER,** for determining the firmness of soil due to its cohesion, by means of the resistance offered to the introduction of a sharp instrument. (See Bulletin No. 50, Bureau of Soils.) The apparatus is essentially as described in the Bulletin referred to, but is supplied with a device for making electrical contact when the soil has been penetrated to the desired depth, as suggested by Prof. Charles F. Shaw of the University of California. Complete as illustrated .....Net 30.00

No. 9141.

No. 9142.

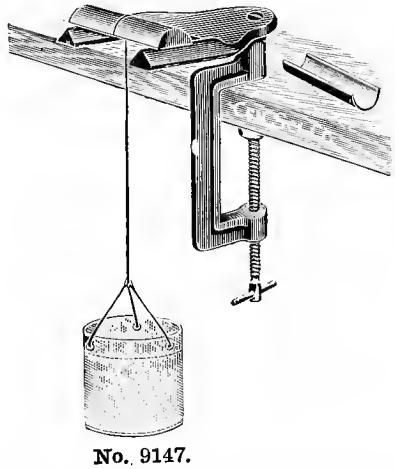
No. 9144.

9141. **PERCOLATION APPARATUS, McCall's,** for determining percolation of water through soils. Glass percolator, 1½ pint, with brass extension having lateral tubes. Complete with rubber gasket, copper gauze, etc. ..... $ 3.00

9142. **PERCOLATORS, Oldberg's,** heavy glass, narrow form, almost cylindrical.

Capacity	½ pt.	1½ pt.	2½ pt.
Each	.30	.40	.50

9144. **PESTLE, Rubber,** for preparing soils for analysis; 7 inches long, wood handle with rubber tip ..... .28



No. 9147.

No. 9147B.

9147. **PLASTICITY APPARATUS,** for determining the effects of lime on plastic soils. Consists of a clamp with two knife edges about 4 inches apart, across which the briquet to be tested is placed for breaking, a heavy canvas bag for holding weights and shot, and one No. 9147A Mold, 5 inches long, 1 inch wide and ¾ inch deep, as illustrated. For those who wish a mold of more accurate dimensions, the purchase of No. 9147B Mold, described below, is recommended. (This design has been developed from the original in use at the University of Illinois, in co-operation with the Soil Physics staff of the University.) 1.65

9147A. **MOLD** only of No. 9147 ..... .15

9147B. **MOLD,** improved form, for No. 9147, as suggested by A. F. Gustafson of the University of Illinois. Of cast brass, accurately milled to shape. All molds are therefore identical and always occupy the same position on the table, so that the bricks of soil obtained are accurate and uniform in shape. Inside cross section ½ square inch, length, 5 inches ..... .67

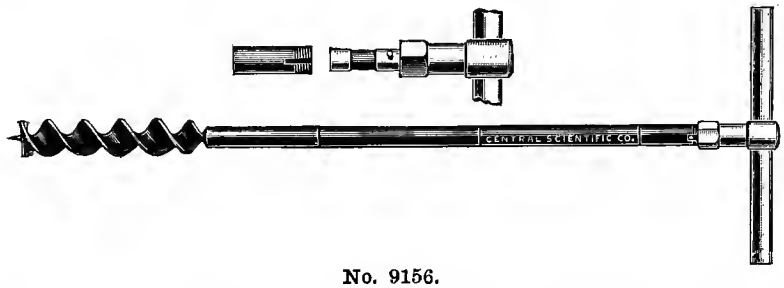
SAMPLING APPARATUS

Nos. 9154 and 9155.

9152. **SOIL AUGER.** (See page 183.)

9154. **SOIL AUGER** for obtaining soil samples. Length 36 inches with graduations every 6 inches; handle detachable; steel cutting edge 1½ inches in diameter. The length may be increased to 72 inches by the insertion of No. 9155 Extension. Complete with handle but without additional length

9155. **EXTENSION** of 36 inches for use with above auger



No. 9156.

9156. **SOIL AUGER,** improved form with stem and handle of smooth finished steel. The handle is attached by means of a lock nut of new design which entirely does away with the loosening and tightening up at the joint which has caused so much difficulty in the earlier types of Soil Augers. This Auger has been made 24 inches long for convenience in carrying when in the field. For use at greater depths extensions 2 feet long and 4 feet long have been provided. (See Nos. 9159 and 9159A.) The auger bit is 1½ inches in diameter and the stem is graduated every 6 inches. This is a thoroughly high-grade tool for the most exacting service.....

9157. **SOIL AUGER.** Same as No. 9156 but with auger bit 2 inches in diameter.....

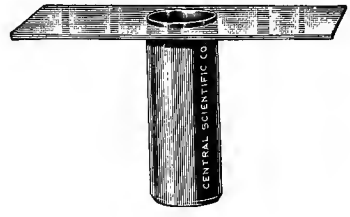
No. 9158.

9158. **SOIL AUGER with Sleeve,** for use in dry soils. This Auger is the same as No. 9156 except that it is provided with a steel sleeve which fits over the auger bit, resting on a projection at the lower end so that the diameter of the cutting edges is larger than the outside diameter of the sleeve. This sleeve is held firmly in position at the upper end by an ingenious locking device and serves to hold in position the dry soil which otherwise would not cling to the Auger when removed from the ground. 2 feet long, graduated every 6 inches. Complete with sleeve and handle

No. 9159.

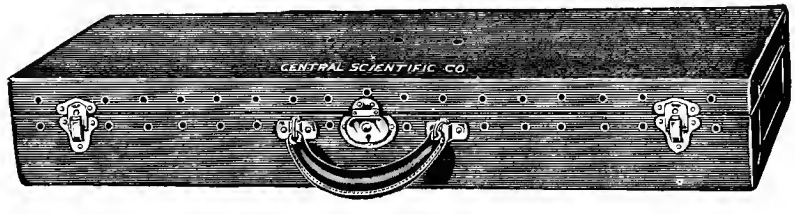
9159. **EXTENSION,** for use with Nos. 9156 to 9158 Soil Augers. Complete with lock nut. Exactly 24 inches long and graduated every 6 inches..... $ 2.25

9159A. **EXTENSION,** for Nos. 9156 to 9158 Soil Augers. Same as No. 9159 but exactly 48 inches long 3.00



No. 9160.

9160. **FOOT PLATE,** for use with any Soil Auger 2 inches or less in diameter to prevent the crumbling away of the soil around the edge of the hole. Consists of a steel tube slightly over 2 inches in diameter provided at the upper end with a steel plate about 4.5 x 10 inches. The tube is driven into the ground before the sampling hole is started and the Plate makes a convenient rest for the feet during the entire operation of removing samples..... 2.00

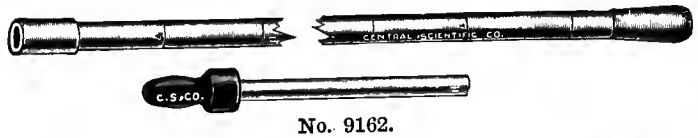


No. 9161.

9161. **CARRYING CASE,** for Auger Field Set, substantially made of hard black fiber with lock and clasps, and handle for carrying. Compartments are provided for holding one No. 9156 Auger (or one No. 9158 Auger), one No. 9157 Auger, two handles for the above, four No. 9159 Extensions, and a wrench for the lock nuts. Complete with Wrench, but without Augers or Extensions .....Net 5.00

9161A. **AUGER FIELD SET,** consisting of No. 9161 Carrying Case with wrench, one No. 9156 Auger, one No. 9157 Auger, and four No. 9159 Extensions .....Net 22.50

9161B. **AUGER FIELD SET.** Same as No. 9161A, but with No. 9158 Auger instead of No. 9156 .....Net 24.00



No. 9162.

No. 9168.

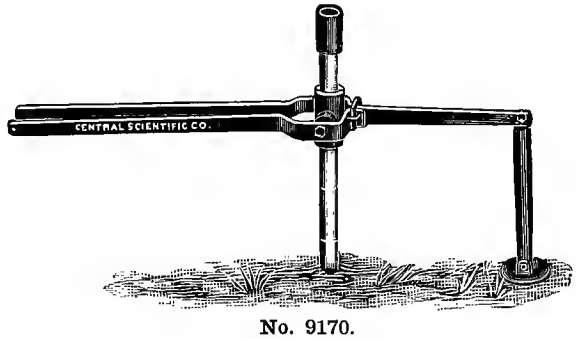
9162. **SOIL SAMPLING TUBE, King's.** Tube of brass, 5 feet long, graduated every 6 inches. Cutting head of steel with area of opening one-ten millionth of an acre. Steel collar at top to receive blows of hammer shown at left of illustration. This hammer is of cast iron, weighing 8 pounds, and is of suitable shape to be held easily in the hand.

To obtain soil samples the tube is driven into the ground to the desired depth by means of the hammer. A column of soil is thus forced up into the tube from which it is jarred after removal from the ground. The outside of the cutter being larger than the tube allows it to be drawn from the ground more easily. If, however, the tube is not withdrawn from the ground with sufficient readiness, No. 9170 Tube Hoist should be used.

With Hammer ..... $ 6.65

9164. **SOIL SAMPLING TUBE, King's.** Same as No. 9162, but 3 feet long. With hammer 6.00

9168. **SAMPLING TUBE BRUSH,** for cleaning Nos. 9162 and 9164 Soil Sampling Tubes. Bristle brush, with strong wire handle. Total length, 65 inches..... .20



No. 9170.

No. 9172.

9170. **SOIL SAMPLING TUBE HOIST.** This contrivance will fill the need for some device for removing Soil Sampling Tubes from the ground. Movement is imparted upward on the handle and, the leverage being ample, no great effort is needed to remove tubes from the most solid soils.

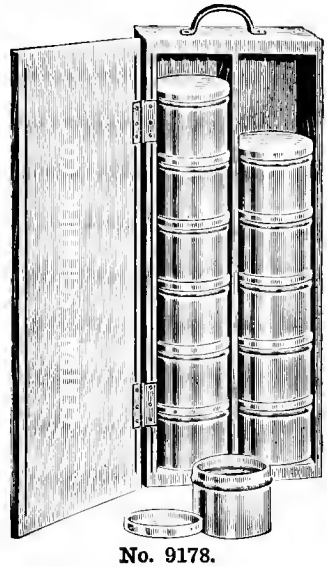
Hoist only, without Sampling Tube..... 6.6

9172. **SOIL SAMPLING TUBE, Whitney's.** Especially useful for obtaining samples for determination of moisture content and nitrifying power of soils; a brass tube 9 inches long, sharpened at one end and with a mark 6 inches from that end, provided with rubber caps for closing each end air tight..... .4

9173. **SOIL SAMPLING TUBE, Noyes' Bacteriological.** (See page 183.)..... 1.6

9176. **SAMPLING CLOTH,** 18 x 18 inches, for receiving soil samples from Soil Samplers. Impervious to moisture. Per dozen..... .9

See also No. 9273 **SPECIFIC GRAVITY TUBE,** page 39.

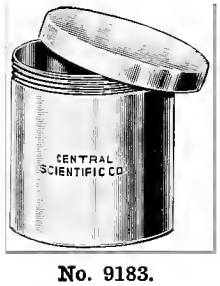


No. 9178.

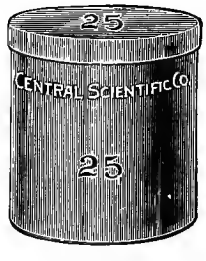
9178. **SAMPLE CARRYING OUTFIT.** The inconvenience of cumbersome fruit jars and soil bags is done away with in the design illustrated. A neatly finished carrying case, with door and handle, holding one dozen seamless tin cans of one pint capacity, with tight-fitting lids. (See No. 9178A.) The suitability of these cans for drying pans makes this an economical outfit, since special pans for the drying oven are not needed. Complete with one dozen cans..... $ 3.35

178A. **SOIL SAMPLE CANS, Seamless Tin,** same style as used in No. 9178.

Capacity, ounces	4	8	16
Per dozen	.22	.33	.55



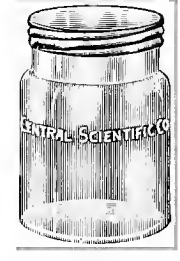
No. 9183.



No. 9183A.

No. 9184.

No. 9184A.



No. 9187.

9183. **SOIL SAMPLE CANS, Aluminum,** with aluminum screw top, as described in Clements' "Research Methods in Ecology," 2¼ inches in diameter by 2½ inches high. Each ..... .45

9183A. **SOIL SAMPLE CANS,** same as No. 9183, but with can and cover numbered. In ordering state what numbers are desired. Each ..... .50

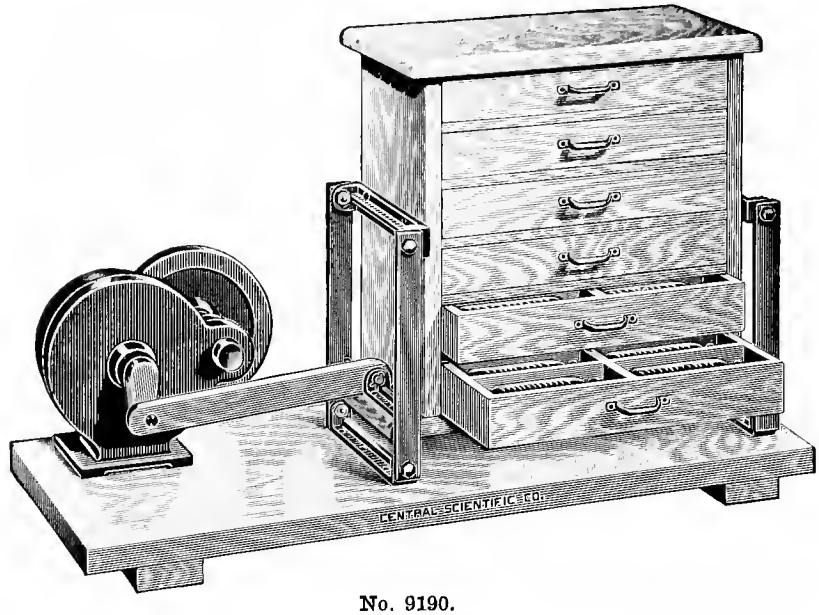
9184. **SOIL SAMPLE CANS, Aluminum,** with aluminum top. The diameter of these cans is uniform so that the cover fits the bottom of the can, making it possible to keep can and cover together while the can is open.

Number	1	2	3
Diameter, inches	2	2½	3½
Height, inches	⅞	1¾	2
Each	.11	.15	.20

9184A. **SOIL SAMPLE CANS,** same as No. 9184, but with can and cover numbered. In ordering state what numbers are desired.

Number	1	2	3
Diameter, inches	2	2½	3½
Height, inches	⅞	1¾	2
Each	.16	.20	.25

9187. **SOIL SAMPLE JARS, Glass,** with metal screw cap, capacity 4 oz. Per dozen..... .55



No. 9190.

9190. **SHAKER, Chest of Drawers Design,** for preparing soils for mechanical analysis. Essentially as described in Bulletin 84 of the Bureau of Soils, but with hinge mounting similar to that described under No. 9192 Shaker. (See page 29.) The gearing is of the enclosed type and is arranged to be belted to any ¼ H. P. motor having V-groove pulley. The chest is substantially made of hardwood nicely finished, and has six drawers each with eight compartments for holding No. 9191 Sterilizing Bottles. Complete on a massive hardwood base with forty-eight No. 9191 Sterilizing Bottles, but without motor. (See below.) ..... $ 55.00

MOTORS

The following motors will be found satisfactory for use with No. 9190 Shaker. They are provided with "V" groove pulley for round belt.

9190A. **MOTOR,** 110 volt D. C., ¼ H. P. ..... Net 24.50

9190B. **MOTOR,** 220 volt D. C., ¼ H. P. ..... Net 25.50

2265K. **MOTOR,** 110 volt A. C., 60 cycle, ¼ H. P. ..... Net 29.50

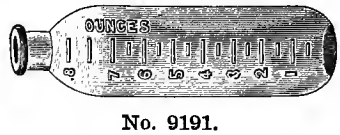
The following motors will be found satisfactory for use with No. 9192 Shaker. (See next page.) They are provided with a "V" groove pulley for round belt.

2263W. **MOTOR,** 110 volt D. C., ⅛ H. P. ..... Net 15.00

2263WW. **MOTOR,** 220 volt D. C., ⅛ H. P. ..... Net 16.00

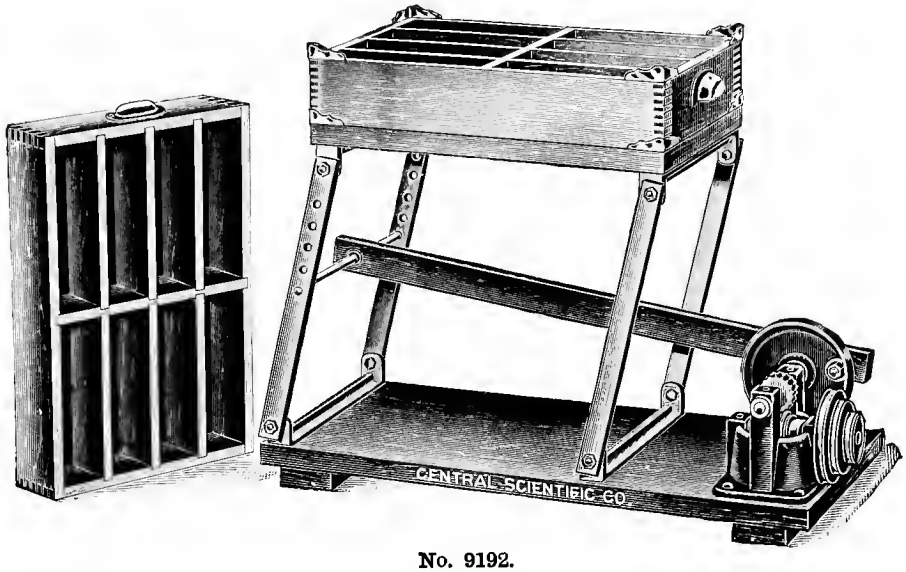
2265E. **MOTOR,** 110 volt A. C., 60 cycle, ⅛ H. P. ..... Net 22.25

For other **MOTORS** see Catalog M.



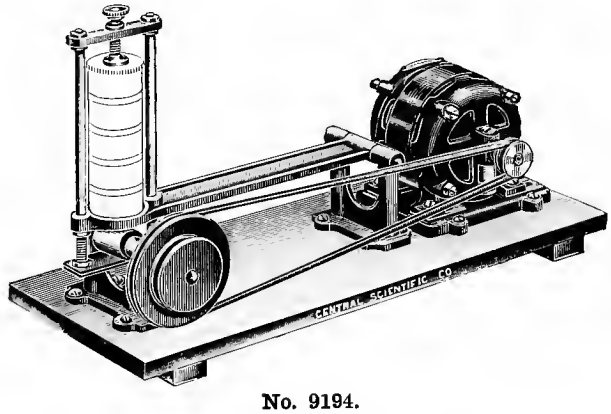
No. 9191.

9191. **BOTTLES, Sterilizer,** capacity 8 oz. Per dozen ..... .45



No. 9192.

9192. **SHAKER, Tray Design,** for preparing soils for mechanical analysis. Two trays with compartments for eight bottles each are mounted on a wooden platform attached to a substantial wooden base by four hinged metal supports. The shaking movement is imparted through a worm gear mounted on the same base. Sufficient power will be furnished by a ⅛ H. P. motor. The trays are both made removable for convenience in handling and filling. Complete with sixteen bottles, but without motor. (For motor see preceding page.) ..... $ 30.00



No. 9194.

9194. **SHAKER, Soil Sieve.** This shaker has been designed for use with No. 9200 Sieves (see next page) as described in Bulletin No. 84, U. S. Department of Agriculture, Bureau of Soils. A motor of 1/20 H. P. is mounted on the same base with an eccentric shaft, to which it is belted. The set of sieves is clamped in a frame at the end of a long lever arm which rests on the eccentric. This lever arm is so attached to the eccentric that much of the noise which usually accompanies shakers of this general type is done away with and a smooth running, efficient device is therefore secured. With motor for 110 volt A. C. current, but without sieves..... 35.00

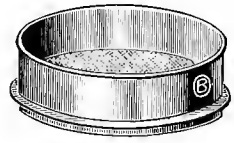
Note—No. 9194 Shaker may be supplied with motor for either A. C. or D. C. current of any desired voltage. Prices will be quoted on application.

9198. **SHRINKAGE APPARATUS.** (See page 183.) ..... .50

No. 9200.

9200. **SIEVES,** as employed in the Laboratories of the Bureau of Soils, Washington, D. C., for mechanical analysis. Set of four sieves with bottom pan, each about 2 inches in diameter by 1 inch high, perfectly fitted, so that the set may be well shaken without coming apart. Shaped so that there is no loss of soil, a great advantage where small samples are being tested. Sieves proper readily replaceable; upper two of brass, with perforations 1 mm. and 0.5 mm. in diameter; lower two of bolting cloth, 64 and 130 mesh; with cover.....

For **SHAKER** for No. 9200 Sieves, see No. 9194.



No. 9202.

9202. **SIEVES,** for preparing soils for analysis. Consists of a seamless brass frame 5 inches in diameter, having brass bottom with circular perforations.

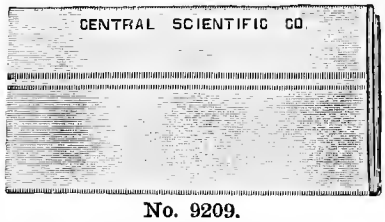
Diameter of perforations, mm.....	½	1	2	3	5
Each	1.30	1.20	1.10	1.10	1.10

9204. **SIEVES,** complete set of five as above (No. 9202) with brass cover and bottom pan..

9206. **SIEVES,** set same as No. 9204 with 3 mm. and 5 mm. sieves omitted.....

For **COVERS** and **BOTTOM PANS** see Nos. 5257 and 5257A on next page.

No. 9208.



No. 9209.

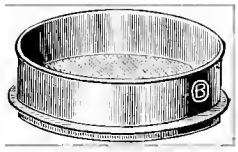
9208. **SIEVE,** without bottom, but with brass ring for holding bolting cloth. Same size as No. 9202 .....

9209. **BOLTING CLOTH, Silk,** for making Soil Sieves, etc. The well-known "Anchor Brand." Standard weight, 40 inches wide.

Number	2	5	7	9	11
Mesh per linear inch.....	52	64	80	96	116
Per foot	.95	1.10	1.20	1.30	1.55
Number	13	15	18	20	25
Mesh per linear inch.....	130	148	168	173	200
Per foot	1.85	2.15	2.90	4.25	5.25

9210. **BOLTING CLOTH, Metal,** Phosphor Bronze Wire, 40 inches wide. This Bolting Cloth will outwear the Silk Bolting Cloth several times, and is of very accurate mesh.

Number	65	80	100	120	150
Mesh per linear inch.....	52	64	80	96	116
Per foot	2.45	2.90	3.35	3.75	5.00
Number	170	200	230	250	300
Mesh per linear inch.....	130	148	168	173	200
Per foot	6.00	7.50	10.00	12.00	15.00



Nos. 5249A-5251A.

5249A. **SIEVES, Brass Frame,** seamless, brass gauze, 5 inches in diameter. (For Covers and Bottom Pans see below.).

Mesh	10	20	40	60	80	100	200
Each	$1.00	1.00	1.05	1.10	1.20	1.40	3.35

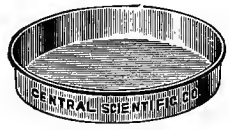
5251A. **SIEVES,** same as No. 5249A; 8 inches in diameter. (For Covers and Bottom Pans see below.)

Mesh	10	20	40	60	80	100	200
Each	1.70	1.70	1.80	1.80	2.00	2.40	5.00

5253. **SIEVES,** same as No. 5249A, in sets of five, one sieve fitting on top of another with one cover and bottom; set consists of 20, 40, 60, 80 and 100 mesh. Per set..... $ 6.55

5255. **SIEVES,** set same as No. 5253; 8 inches in diameter 10.70

No. 5257.



No. 5257A.

5257. **COVERS,** for Nos. 5249A, 5251A and 9202 Sieves.

Diameter, inches	5	8
Each	.40	.50

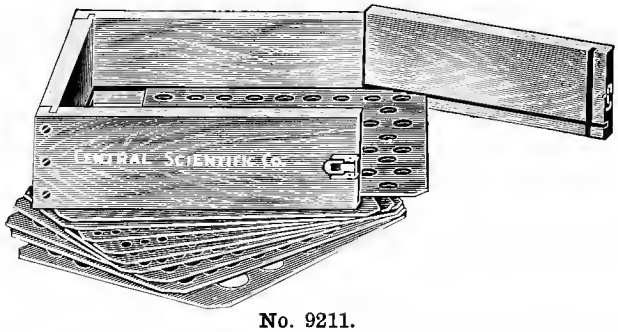
5257A. **BOTTOM PANS,** for Nos. 5249A, 5251A and 9202 Sieves.

Diameter, inches	5	8
Each	.40	.50

No. 5258.

5258. **SIEVES, Wooden frame,** brass gauze, diameter 6 inches.

Mesh	20	40	60	80	100	200
Each	.38	.40	.45	.60	.75	1.40

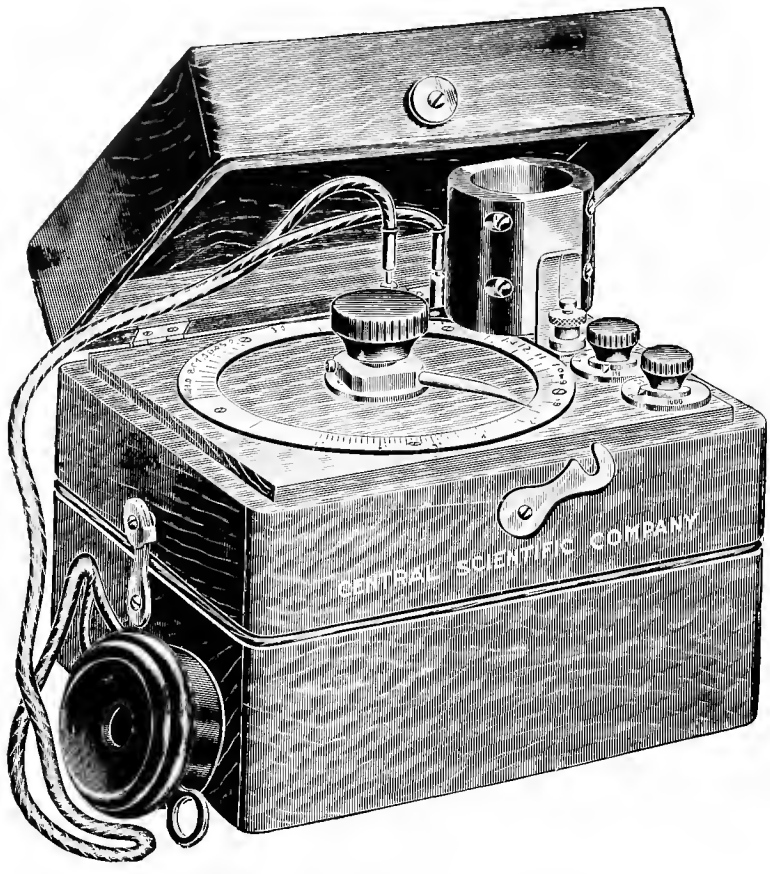


No. 9211.

9211. **SET OF SIEVES.** Consists of a heavy wooden frame provided with a slot in which may be placed bottoms of perforated steel, and hinged at one end to facilitate removal and replacement of these metal bottoms. Inside dimensions of frame, 17½ x 14 x 5 inches. Ten bottoms are included with perforations ⅛, ¼, ½, ¾, 1, 1¼, 1½, 2, 2½, and 3 inches.....Net 12.00

For **SIEVES** for Corn Testing see page 49.

SOIL CONTENT TESTERS



No. 9214.

9214. **CONDUCTIVITY BRIDGE**, for determining the soluble salt content of soils; made after designs approved by the U. S. Bureau of Soils. (See Bulletin No. 61, 1910.)

The use of this bridge depends on the fact that the electric current is conducted by the salt in solution and that the conductance of the solution or, conversely, its resistance to the passage of the current, is determined largely by its concentration. The magnitude of current that will pass is increased by an increase of salt in solution; or the resistance to the passage of the current decreases with the increase of salt. The instrument is of general utility in measuring the resistances of solutions and of soils. It is designed primarily for use as a field instrument, and finds its greatest use in determinations of "alkali" or harmful excess of soluble salts, frequently present in the soils of arid and semiarid areas. In survey work is gives a convenient method for determining in the field the percentage of alkali in a soil, so that the mapping may be carried on concurrently. It is also useful in determining the salt content of irrigation and seepage waters.

The instrument, by means of which resistances are measured, is a modified form of slide-wire Wheatstone's bridge. In operating the bridge, the cup is filled with the soil saturated with water, and placed in the clips provided for it. The resistance of the cup contents is then read, and from the resistance the amount of soluble salt present determined by reference to the tables given in the Bulletin mentioned above.

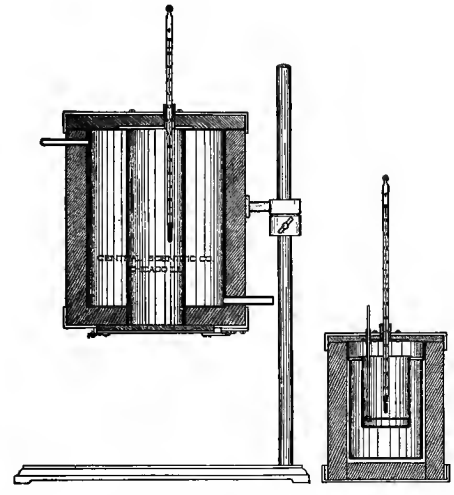
Complete as described.....Net $ 100.00

Note.—Bridges of the above type made by us have proved satisfactory to and met the requirements of the U. S. Bureau of Soils, Washington, D. C.

Bridges of this type are used by the Atchison, Topeka & Santa Fe Railway Company for testing the alkali content of their tank water.

9215. **DRY BATTERY,** complete, as used in No. 9214 Conductivity Bridge. Each.....Net 1.00

No. 9217.



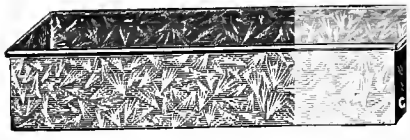
No. 9219.

9217. **TRUOG SOIL ACIDITY TESTER.** This apparatus is made after specifications by E. Truog of the University of Wisconsin. The principle employed is an entirely new one and indicates clearly not only the presence of soil acidity but the degree of the acidity. Consists of a specially designed Alcohol Heater together with a 50 c.c. Graduate, Boiling Flask, Measuring Cup, Spatula, and all necessary reagents. The test is completed in from 10 to 15 minutes, and the presence of acidity is shown by discoloration of the white test paper used, and the degree of acidity by the exact color assumed by the paper as compared with a chart of standard colors furnished. A full set of directions giving exact description of the test with all precautions is included. Complete as described, in a neat hardwood carrying case...Net $ 5.00

9219. **SPECIFIC HEAT APPARATUS** (modified design after Prof. A. G. McCall) for determining the Specific Heat of Soils; may also be used for determining the specific heat of any substance. Consists of a double-walled heater or steam jacket with large rectangular base and support rod, and a double-walled calorimeter. Both heater and calorimeter are of very substantial construction, and are well insulated. The heating chamber extends through the heater and is closed at both ends with heavy insulated coverings. The top cover has two openings, one for a thermometer, and the other for suspending the sample to be tested. The clamp which holds the heater rests on a collar which is clamped to the support rod, so that when the sample has come to a constant temperature the lower cover of the heater can be swung back out of the way and the heater rapidly swung around to a position over the calorimeter. The transfer of the specimen from heater to calorimeter can thus be readily and quickly effected. Heater and calorimeter complete as described, but without thermometers 30.00

9219A. **CALORIMETER** only of No. 9219 without thermometer 10.00

No. 9221.

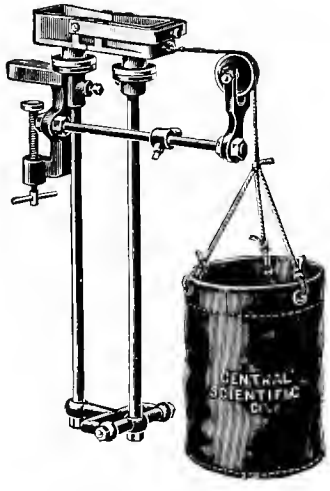


No. 9224.

9221. **TANK**, for holding water, of galvanized iron, 12 inches in diameter, with drop handles, for use with all soil tubes 14 inches long, or under, e. g., No. 9277, page 39..

9222. **TANK**, for holding water, of galvanized iron, 12 inches in diameter. For use with soil tubes 36 inches long, or under; made especially for No. 9251 Tube, page 36....

9224. **TANK**, for holding water, of galvanized iron, 26x6x6 inches. For use in all capillarity experiments. Used with Tubes Nos. 9251-9263, pages 36 and 37.....



No. 9227.
(Patent applied for.)

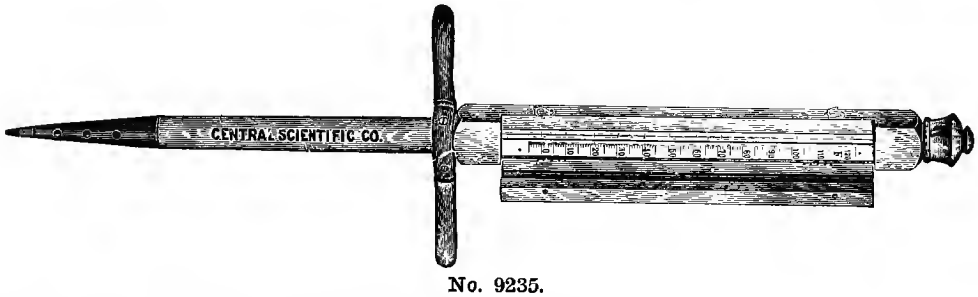
9227. **TENACITY OF SOILS APPARATUS**, for determining the tenacity of moist soils. In this new and improved design, which has been developed from the original in use at the University of Illinois, the inaccuracies due to friction, caused particularly by a collection of dirt on the moving parts of the instrument, have been completely obviated, and constant conditions thereby assured. Two brass soil containers are supported on a hinged frame which in turn is securely clamped to the table top. The soil containers are removable from the frame and are so constructed that they may be immediately replaced in exactly the same relative position. In use, the containers are held firmly together by means of the metal stirrup shown in the illustration; the moist soil is compacted in the containers and smoothed level with the top, thus leaving one square inch section for testing. Weights are now placed in the hanger sufficient to pull the soil apart. Complete, as illustrated, with canvas hanger, but without weights.....

No. 1191.

1191. **THERMOMETER, Soil,** 10 inch glass cylindrical thermometer, with paper scale, in turned wood case with brass pointed bottom ..... $ 1.40

No. 9233.

9233. **THERMOMETER, Soil,** standard grade, 10 inch glass cylindrical thermometer with metal scale, mounted on turned wood frame with brass pointed bottom..... 2.25



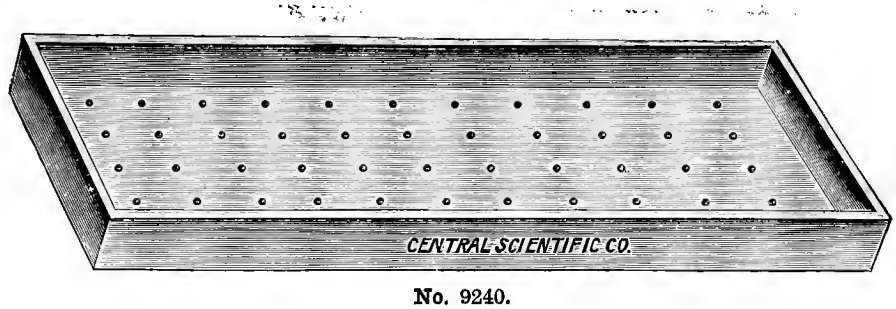
No. 9235.

9235. **THERMOMETER, Soil.** Thermometer set in oak with steel point. Scale engraved on stem. Range from –4° to 120° Fahrenheit, by ½° divisions. Supplied for use at four different maximum depths.

Depth, cm.	25	50	75	100
Depth, inches, approx.....	10	20	30	40
Price	5.50	6.65	7.75	9.00

9237. **THERMOMETER, Soil, Recording.** (See page 184.).....Net 48.00

For **CHEMICAL THERMOMETERS,** see page 167.



No. 9240.

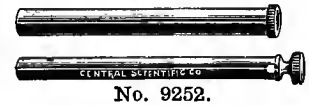
9240. **TRAY, Color,** for testing effects of color of soils on temperature. Waterproofed wooden tray, 6 ft. x 3 ft. x 6 inches deep, with drainage..... 15.00

9242. **TRAYS, Drainage,** for showing effects of drainage on temperature of soils. Two water-proofed wooden trays, each 3 ft. x 4 ft. x 6 inches deep, one made water tight, the other provided with drainage. Per set..... 20.00

9244. **TRAY, Puddling,** for mixing and working soils. Water tight, waterproofed wooden tray, 25 inches x 25 inches x 2¼ inches. Will not warp..... 3.00

TUBES AND ACCESSORIES

No. 9251.



No. 9252.

9251. **CAPILLARITY TUBE, McCall,** with side tubes for studying the distribution of moisture in vertical columns of soil; also for determining the lateral movement of capillary moisture. Of brass, 36 inches long by 2 inches in diameter, with perforated bottom and small lateral tubes at definite intervals ..... $ 2.25

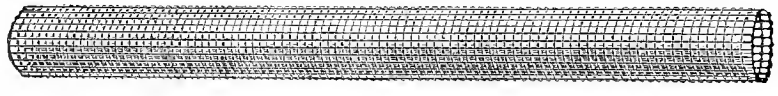
9252. **SAMPLING TUBE,** for use in obtaining samples from the side openings of No. 9251 Capillarity Tube as suggested by Prof. John A. Slipher of Purdue University. A brass tube with diameter slightly contracted at the sharpened end is provided with a plunger by which the sample of soil may be ejected..... .50

Nos. 9253-4.

9253. **CAPILLARITY TUBE, McCall,** for determining the rate of the capillary rise of water in soils. Of brass, 36 inches long by 2 inches in diameter, with perforated bottom. Running lengthwise of the tube is a slot fitted with a window of thin celluloid through which the moisture height may be noted. The construction of this tube is such that an additional length, which the illustration shows in place, may readily be attached. Without additional length..... 3.35

9254. **EXTENSION TUBE** with coupling for studying rise of moisture to greater height than is possible with No. 9179 alone. Of brass, 36 inches long, with coupling..... 3.85

9254A. **CELLULOID STRIP,** 36 x 3 inches, for either No. 9253 or No. 9254..... .30



No. 9257.

9257. **CAPILLARITY TUBES,** of celluloid protected by wire gauze. These tubes consist of a cylinder of galvanized iron wire gauze 2 inches in diameter, surrounding a cylinder of thin transparent celluloid formed of a strip of celluloid sufficiently wide to go 1½ times around the tube. These tubes are soil tight, transparent, and durable, and are very satisfactory for studying the distribution of water in capillary rise experiments, since the inner tube may be withdrawn and unrolled, exposing the soil for easy sampling.

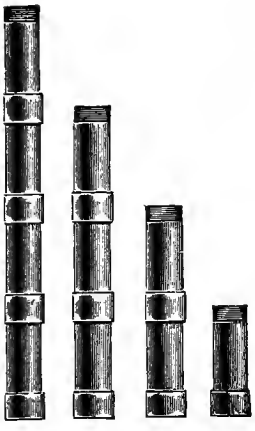
Length, inches	12	24	36	48
Each	.55	.75	1.10	1.65

9257A. **CELLULOID STRIPS** for No. 9257 Tubes.

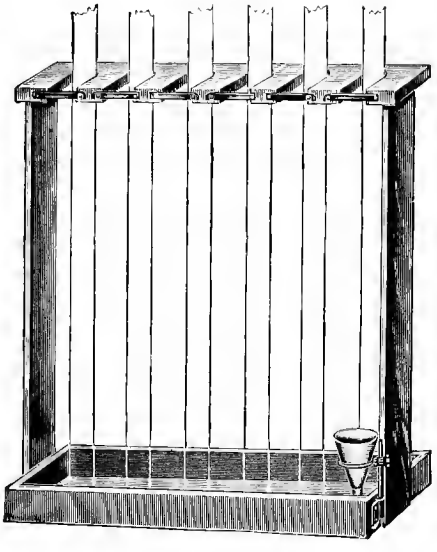
Length, inches	12	24	36	48
Each	.20	.45	.60	.85

For **CLEANING BRUSH,** see No. 9282, page 39.

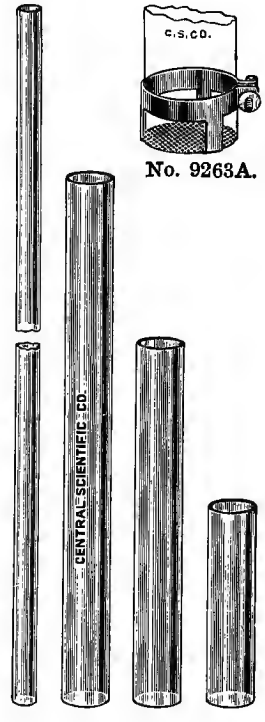
For **SUPPORT,** see No. 9262, page 37.



No. 9259.



No. 9262.



No. 9263A.

No. 9263.

9259. **CAPILLARITY TUBES, Sectional,** for determining capillary rise of water in soils. These sections are made of heavy brass tubing and are 8 inches long by 1½ inches in diameter. Each section is threaded at both ends to receive brass couplings so that the tubes may be built up to any desired length. The tubes may readily be cleaned, and the breaking of the soil column which causes so much annoyance in long brass and glass tubes is obviated, because the section joints, which are tight enough to prevent evaporation losses from the soil, are loose enough to permit equalization of air pressure inside and outside of tube. (For Bottom Tube, see No. 9260 below.) Per section (with one coupling) ..... $ 0.60

9260. **BOTTOM TUBE.** Same size as No. 9259, but with a perforated bottom. For use as lowest tube of set..... .75

9262. **CAPILLARITY TUBE SUPPORT** for supporting 2-inch tubes 32 inches long or longer in a vertical position. Will hold six tubes which may be readily removed or put in place. The base is constructed in form of a tray and holds a water-tight zinc tank. A rod and ring at the side of the tray is designed to hold an inverted flask so that the height of the water in the tray may be kept constant. Complete as illustrated, but without flask or tubes..... 6.00

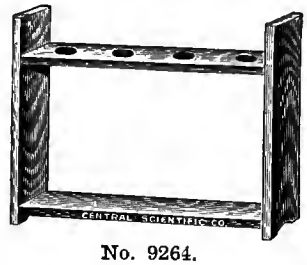
9263. **CAPILLARITY TUBES, Glass.**

Diameter, inches	2	2	2	1
Length, inches	8	15	24	60
Price, each	.11	.45	.75	.55

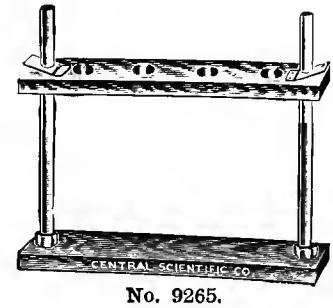
9263A. **PERFORATED BOTTOM,** for 2-inch Glass Soil Tubes. May be used with tubes from 1$\frac{5}{8}$ inches to 2$\frac{1}{8}$ inches in diameter. Clamps firmly to the bottom of the tube, but may readily be removed for changing from one tube to another..... .15

For **CLEANING BRUSH,** see No. 9282, page 39.

No. 6211.



No. 9264.



No. 9265.

6211. **CAPILLARITY TUBE,** Glass, student's lamp chimney form. Per dozen..... $ 0.70

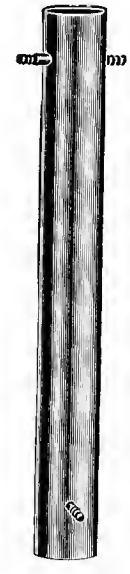
9264. **SUPPORT,** of wood, for holding four No. 6211 Capillarity Tubes..... 1.00

9265. **SUPPORT,** for four No. 6211 Capillarity Tubes, more substantial than No. 9264. Base of wood with metal uprights and adjustable shelf for supporting tubes; finely finished 1.65

2102. **TUMBLERS,** for use with No. 6211 Tubes; ½-pint size. Per dozen..... .45

For **ORGANIC MATTER TUBES,** see No. 9263 Glass Tubes.

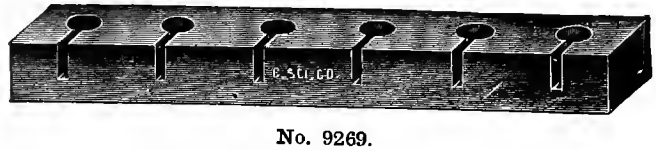
No. 9266.



No. 9267.

9266. **PERCOLATION OF AIR TUBE,** for comparing the rate of the flow through soils. Made of brass, 18 inches long by 2 inches in diameter, with outlet tube near bottom.. .90

9267. **PERCOLATION OF WATER TUBE,** for determining the rate of percolation of water through soils. Of brass, 18 inches long by 2 inches in diameter, with lateral inlets and drainage tube, and with solid bottom below and perforated bottom above drainage tube..... 1.25



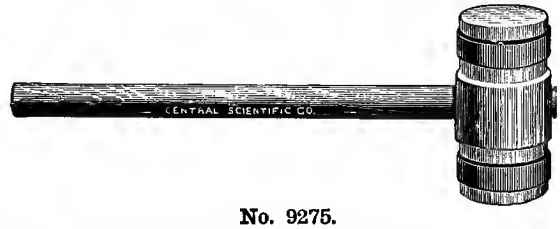
No. 9269.

9269. **SUPPORT BLOCK,** for use with No. 9267 Percolation Tube. This block is necessary when several soils are to be compared..... 1.50

For **CLEANING BRUSH,** see No. 9282, page 39.

No. 9273.

No. 9274.



No. 9275.

9273. **SPECIFIC GRAVITY TUBE,** for determining the apparent specific gravity of surface soils under field conditions. Of steel, 12 inches long by 3 inches outside diameter, with cutting edge ..... $ 2.00

9273A. **SPECIFIC GRAVITY TUBE,** same as No. 9273, but 4 inches inside diameter..... 4.00

9274. **DRIVING HEAD** of cast iron. For use with No. 9273 Specific Gravity Tube to prevent battering the upper edge when the tube is driven into the ground..... .40

9274A. **DRIVING HEAD.** Same as No. 9274, but for use with No. 9273A Tube..... 1.10

9275. **MAUL,** for driving No. 9273 Specific Gravity Tube. Substantially made with a hickory head, reinforced by steel rings to prevent splitting. The handle is two feet long, and the Maul is sufficiently heavy for its purpose, without being clumsy....Net 2.00

No. 9277.

No. 9280.

9277. **VOLUME WEIGHT TUBE,** for determining volume weight and pore space. Of brass, 12 inches long by 2 inches in diameter, with solid bottom, and crease one inch from the top ..... .60

9278. **VOLUME WEIGHT TUBE,** for elementary work, of brass, 1½ x 3½ inches..... .25

9280. **WATER HOLDING CAPACITY TUBE.** Brass, 12 inches long by 2 inches in diameter, with perforated bottom, 1½ mm. perforations, and crease one inch from top.. .60

No. 9282.

9282. **TUBE BRUSH,** for cleaning soil tubes of 2-inch diameter; has a wooden handle 3 feet long and is provided with a tuft of bristles at the end for reaching the bottom corners of the tube..... .50

Nos. 9288-9290.

No. 9291.

9288. **SOIL TUBES.** These tubes are so constructed that one style of tube may be used for all experiments. They are made from brass tubing 10 inches long. A cast brass base, which is corrugated on its upper surface, is soldered into the bottom of the tube. On the lower surface of this casting is a connection for rubber tubing. A brass disc with circular perforations, and somewhat smaller than the inside of the soil tube, is dropped to the bottom of the tube and rests on the corrugated surface of the brass base, allowing free passage of air or water through the tube. By means of the connections shown, six soil tubes can be connected in series by means of rubber tubing so that a constant water level may be obtained in all the tubes. Each ..... $ 1.10

9289. **TUBE RACK.** The tube rack consists of a cast iron base, smoothly finished and japanned, to which is attached an upright standard. On this standard are carried two castings, the lower one being arranged to take and hold the lower ends of the soil tubes by means of lugs on its upper surface, and the upper consisting of a series of rings to support the upper ends of the soil tubes in a concentric position. This arrangement holds the tubes securely, but still allows them to be removed or replaced very easily. At the same time it is compact, the rack and tubes occupying less than one square foot of desk room 1.65

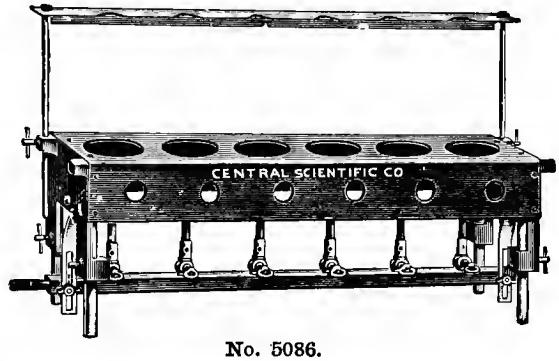
9290. **SUPPLY TANK** used in determining the comparative rate of flow of water through various soils. This tank is made of polished brass and rests on the top of the standard of the tube rack by means of a socket in its base. Two short brass tubes extend downward from the base of the tank in such a position as to fall within the two soil tubes on opposite sides of the rack. The six soil tubes having been connected in series, the water flows from the tank to the soil tubes, maintaining a constant water level therein..... 2.25

9291. **SOIL TUBE AUGER** for removing wet soil from tubes. This auger is 1¾ inches in diameter, of twist pattern and made from polished cast steel. Will clean tubes to the bottom 2.00

No. 9295.

9295. **WATER RETENTION CUP,** for determining the maximum water retained by soil. (See Hilgard's "Soils," page 209.) Of brass 2 inches in diameter by ⅞ inch high, with diaphragm of perforated metal fastened about $\frac{1}{16}$ inch below top. This cup is used in studying the wilting point by means of the direct relationship which exists between the maximum water retained by any soil and the wilting point.... .20

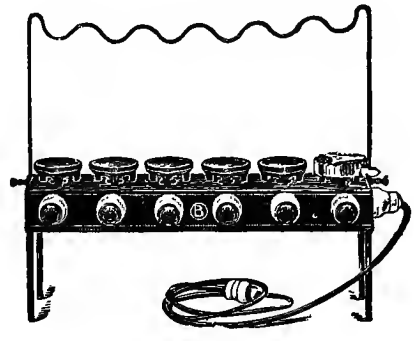
NITROGEN DETERMINATION APPARATUS



No. 5086.

5086. **DIGESTING SHELF, Kjeldahl's,** oblong form, made of sheet iron, with rod to support flasks. The shelf is supported on adjustable legs. Six burners in a row with stop cocks. Size of apparatus, 24 inches long, 5½ inches wide, 9½ inches high.. $ 15.00

5086A. **DIGESTING SHELF, Kjeldahl's,** same as above, with 10 burners. Size of apparatus, 40 inches long, 5½ inches wide, 9½ inches high..... 20.00

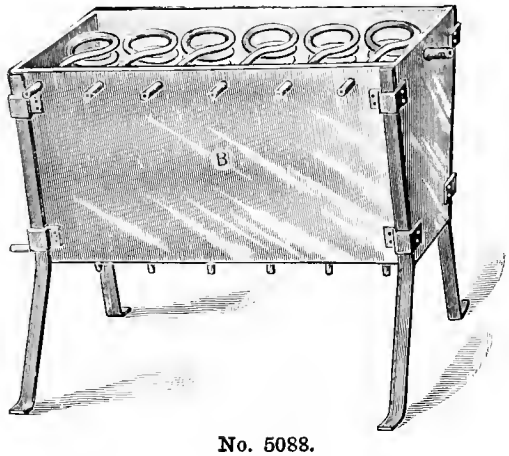


No. 5087.

5087. **DIGESTING SHELF, Kjeldahl's.** Electrically heated, made of sheet iron with a support for the flasks. Each heater being a unit, any one, or all, may be used at one time as desired. 24 inches long, 5½ inches wide and 9 inches high, with six heaters. (See note.).....Net 45.00

5087A. **DIGESTING SHELF, Kjeldahl's,** same as No. 5087, but 40 inches long and with 10 heaters. (See note.).....Net 65.00

Note.—In ordering state voltage desired. Unless otherwise specified heaters for 110-volt current will be supplied.



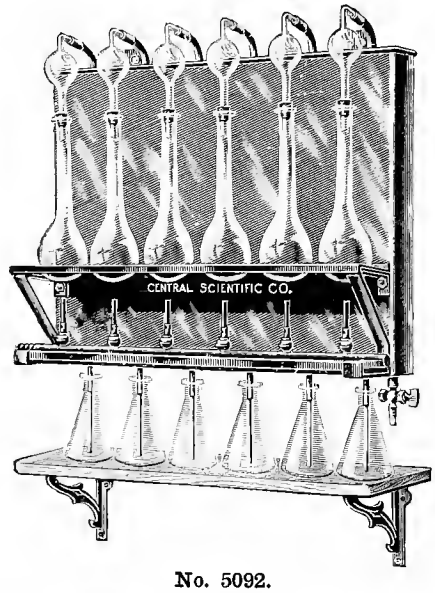
No. 5088.

5088. **CONDENSER, Kjeldahl,** copper tin lined, with six coils of pure block tin tubing. Size of apparatus 24 inches long, 6½ inches wide, 14 inches deep; height, including legs, 24 inches..... $ 22.00

5088A. **CONDENSER, Kjeldahl,** same as No. 5088, but with 10 coils. Size of apparatus, 40 inches long, 6½ inches wide, 14 inches deep; height, including legs, 24 inches..... 35.50

5090. **KJELDAHL'S APPARATUS,** consists of No. 5086 Digesting Shelf (6 burners) and No. 5088 Condenser..... 37.00

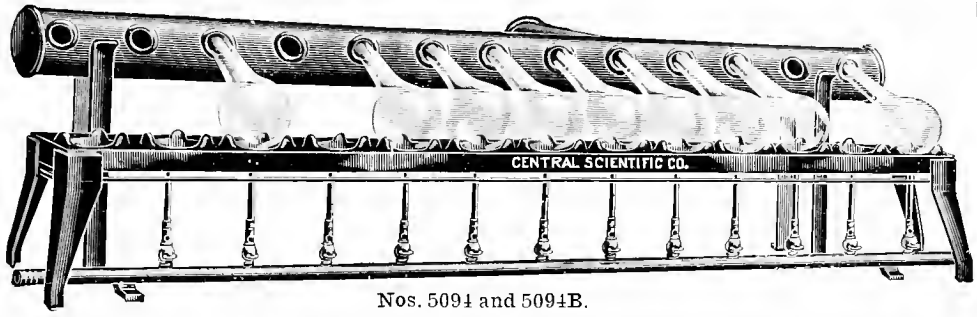
5090A. **KJELDAHL'S APPARATUS,** consists of No. 5086A Digesting Shelf (10 burners) and No. 5088A Condenser..... 55.50



No. 5092.

5092. **DISTILLING APPARATUS, Kjeldahl's,** wall form. The most convenient form of this apparatus offered. All working parts of the apparatus are readily accessible from the front. The burners are provided with stop-cocks for individual regulation so that any or all of the burners may be used at once. The condenser tank is of heavy copper with block tin condenser tubes. With six burners but without glassware or shelf 42.00

5092A. **DISTILLING APPARATUS, Kjeldahl's,** same as No. 5092, but with burners for gasoline gas 42.00



Nos. 5094 and 5094B.

5094. **DIGESTING SHELF, Johnson's,** as used in Agricultural Experiment Stations. Shelf of iron, with holes 5 inches from center to center, of such shape as to support Kjeldahl flasks. The necks of the flasks may rest in holes in a large lead tube connected with a chimney so that all fumes are carried away. On account of the varying conditions in different laboratories, it is impossible to list this Digesting Shelf complete with the lead pipe and its support. It is recommended that tubing (No. 5094A) be purchased and fitted in position locally. In case this is not possible, see No. 5094B below. Complete with stopcock Bunsen burners, but without flasks, lead pipe, or support for pipe.

No. of Burners	6	10	13
Approximate length, in	30	50	65
Each	$ 16.65	19.00	21.00

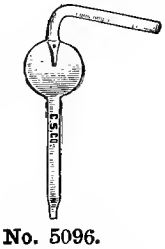
5094A. **LEAD TUBING** for use with No. 5094, inside diameter 4 in., per foot ..... $ 0.83

5094B. **LEAD TUBE** for No. 5094, inside diameter 4 in., complete with holes for necks of flasks, and with support. Outlet tube 12 in. long, located in middle of long tube.

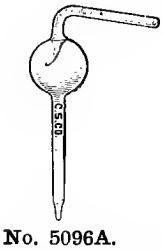
No. of holes	6	10	13
Each	11.00	15.50	18.00

Note.—If the outlet tube is desired in any other position, give exact specifications when ordering.

No. 4906A.



No. 5096.



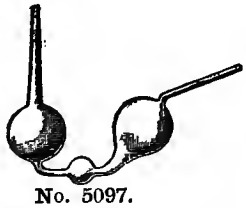
No. 5096A.

4906A. **FLASKS, Kjeldahl's Digesting and Distilling,** pear shaped, extra long neck. Jena glass.

Capacity, c.c.	200	500	1000
Price	.23	.40	.60

5096. **CONDENSER BULB TUBES, Kjeldahl's,** as modified by Hopkins (Journal American Chemical Society, No. 3, 1896) ..... .60

5096A. **CONDENSER BULB TUBES, Kjeldahl's,** original design ..... .45



No. 5097.

No. 5098.

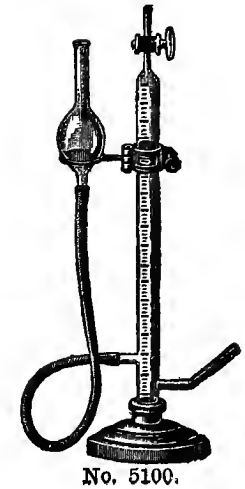
No. 5099.

5097. **NITROGEN BULBS, Will-Varentrapp,** 3 bulbs, pear shaped .30

5098. **NITROGEN BULBS, Fresenius** ..... .45

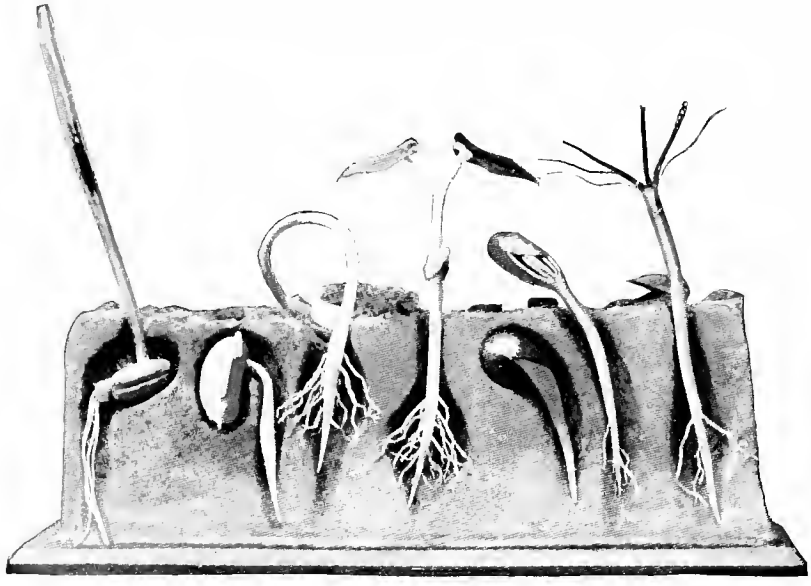
5099. **NITROGEN BULBS, Volhard** ..... .40

5100. **NITROMETER, Schiff** 5.55



No. 5100.

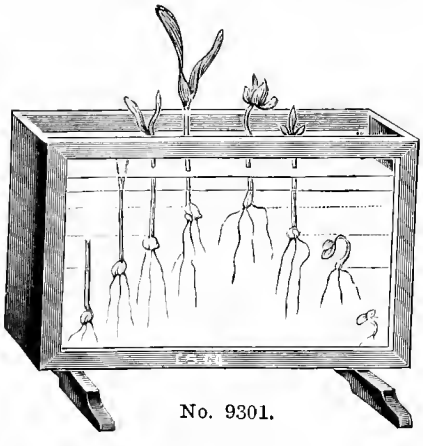
SOIL FERTILITY OR SEED CULTURE



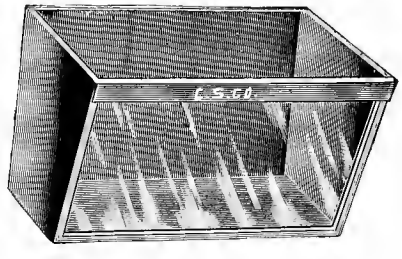
No. 9300.

9300. **MODEL OF GERMINATION.** A model 40 cm. high by 60 cm. long, showing germination of the bean (Phaseolus vulgaris), rye (Secale cereale), and spruce (Picea excelsior).

This model shows in a very instructive manner the germination of the three named seeds. The difference in the development of the monocotyledonous rye and the dicotyledonous bean is well brought out, as is also the contrast between their developments and that of the spruce. In pasteboard box.....Duty Free $ 10.50



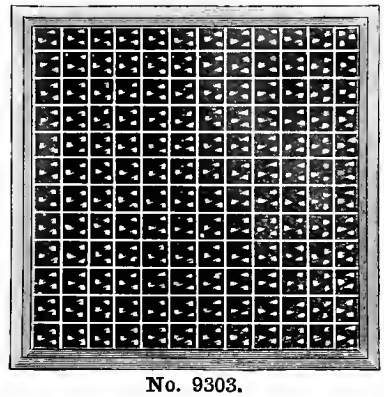
No. 9301.



No. 9302.

9301. **GERMINATING BOX,** for showing proper depth to plant seeds. (From Farmer's Bulletin No. 218.) Substantially made of galvanized iron 15 inches long by 8 inches high, with glass front and back. Since the distance between the front and back glass plates is but ¾ of an inch, the observation of the germination of seeds planted at different depths is made easy. To exclude light from the seeds during germination a metal slide or shield is provided for each side of the box..... 3.00

9302. **GERMINATING BOX, Ganong Pattern,** for sprouting and for observing root growths. Light, rust-proofed metal box with inclined glass front. Dimensions, 7⅞ inches long, 5 inches deep, 5¾ inches wide at the top, 4 inches wide at the bottom..... .55



No. 9303.

9303. **GERMINATING TRAY,** 25 x 25 x 2¼ inches deep, for testing fertility of corn and other grain. This tray is substantially made of wood, water-proofed to prevent warping. A frame which fits into the tray is divided into 144 squares which may be numbered if desired ..... $ 4.50

No. 9304.

9304. **GERMINATING TRAY,** 18 x 10 x 2 inches deep, well made of wood..... 1.65

No. 9305.

No. 8083.

No. 9306.

9305. **GERMINATING PLATE,** of heavy glazed earthenware, 10 inches in diameter. For holding moist blotting paper in germination experiments ..... .15

5135. **GERMINATING PLATE,** of porous clay, 9 inches in diameter. Obviates the use of blotting paper in germination experiments..... .13

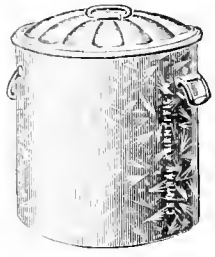
8083. **GERMINATING PLATE,** of porous clay, 4⅛ inches in diameter by $\frac{7}{16}$ inch deep, with straight sides..... .10

9306. **GERMINATING PLATE,** of graniteware, 11 inches in diameter by 1¼ inches deep. For use with moist blotting paper in germination experiments ..... .22

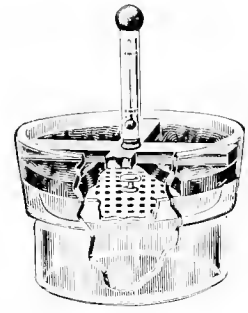
9306A. **SPROUTING CUP,** as described in Bulletin No. 35 of the Rhode Island Experiment Station, and on page 14 of Bailey's "Nursery Book." Of porous clay 3 inches in diameter by 1¾ inches high, with ventilated cover and glass dish..... .40

9295. **WATER RETENTION CUP,** for study of wilting point. See description and illustration on page 40..... .20

For **FLOWER POTS,** see page 51.



No. 9018.



No. 9307.

9018. **GRAIN CONTAINER,** of heavy galvanized iron, with handles and cover; will hold half-bushel. Each ..... $ 1.00

9307. **SPROUTING APPARATUS, Schoenjahn's Patent,** for quickly determining the percentage sprouting value of barley, showing its malting quality. Equally efficient in showing sprouting value of all grains. This apparatus is simple and exceedingly practical. Complete with directions..... 6.65

9308. **SULPHUR DETERMINATION APPARATUS.** (See page 185.)..... 2.00

No. 9309.

No. 9311.

9309. **SPRINKLER, Rubber,** bulb of extra quality. 8 ounce size. Straight neck..... 1.00

9311. **SPRINKLER, Rubber,** same as above but with bent neck..... 1.10

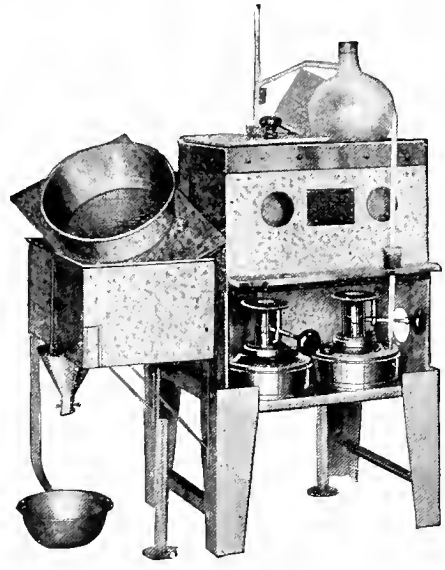
No. 9316.

No. 9318.

9314. **TROWEL,** 6 inch cold rolled steel blade, with malleable iron shank firmly riveted on. .10

9316. **TROWEL,** first quality, made of one solid piece of steel and will outwear all others. Blade 6 inches long..... .50

9318. **TROWEL, Transplanting or Collecting,** with narrow and deeply curved blade 6 inches long; useful with the collecting case or as a transplanter, dibber, or weed digger.. .15



MOISTURE TESTERS

OFFICIAL BROWN-DUVEL

(See Bulletin No. 99, and Circular No. 72, Bureau of Plant Industry, United States Department of Agriculture.)

These testers were developed primarily to meet the needs of grain dealers for a rapid and exact method of determining the moisture in corn. Methods have now been worked out for making moisture tests of the more important cereal grains and some of the more important seeds, as well as for flour and ground grain. The method is entirely practicable for making moisture determinations of practically all substances which admit of a free circulation of oil during the heating. The apparatus consists of a heating chamber divided into compartments for testing a number of samples at the same time; a cold water tank through which condenser tubes pass; burners; thermometers; special side-neck flasks; graduated cylinders; and No. G363 Automatic Oil Measuring and Grain Separating Device. All testers are 12½ in. wide and 31 in. high.

These testers are the standard form as specified in Paragraph 11 of the Federal Corn Grades, effective July 1, 1914.

Note.—If Jena glass flasks are desired in the place of the regular glass flasks, add $0.50 per compartment to the prices below; if single-wall copper flasks, add $3.00 per compartment; if double-wall copper flasks, as used in flour testing, add $4.40 per compartment.

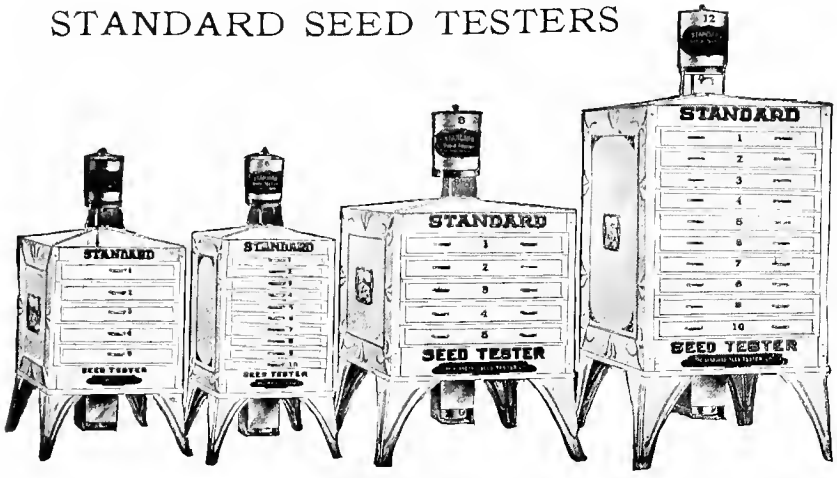
G350.	**MOISTURE TESTER,** two compartment, 13 in. long, with gas burners.....Net		$35.00
G351.	**MOISTURE TESTER,** same as No. G350, but with alcohol burners.....Net		35.00
G352.	**MOISTURE TESTER,** same as No. G350, but electrically heated.....Net		50.00
G353.	**MOISTURE TESTER,** four compartment, 26 in. long, with gas burners.....Net		50.00
G354.	**MOISTURE TESTER,** same as No. G353, but with alcohol burners.....Net		50.00
G355.	**MOISTURE TESTER,** same as No. G353, but electrically heated.....Net		80.00
G356.	**MOISTURE TESTER,** six compartment, 39 in. long, with gas burners.....Net		65.00
G357.	**MOISTURE TESTER,** same as No. G356, but with alcohol burners.....Net		65.00
G358.	**MOISTURE TESTER,** same as No. G356, but electrically heated.....Net		110.00

ACCESSORIES FOR MOISTURE TESTERS

G359.	**FLASK, Glass,** 1000 c. c., for moisture testers .....Net		1.00
9329.	**FLASK, Jena Glass,** 1000 c. c., for moisture testers .....Net		1.50
9330.	**FLASK, Copper,** single wall, 1000 c. c., for moisture testers .....Net		4.00
9331.	**FLASK, Copper,** double wall, inner vessel 900 c. c., for moisture testers.....Net		5.40

For other **ACCESSORIES** see page 185.

STANDARD SEED TESTERS



Nos. 9338B to E.

It gives us pleasure to announce that we are now sole School Agents throughout the United States for the Standard Seed Tester. For some time we have desired to add to our line of Agricultural Apparatus a high grade seed tester for School and College use, and after carefully looking over the field we selected the Standard Seed Tester as our choice because we believe it to be the cleanest, quickest and most accurate Seed Tester on the market. This is evidenced by the fact that within the short time since this device was marketed it has come into general use by the leading Schools and Agricultural Colleges, seedsmen, florists, canners, maltsters, pure seed commissioners and farmers throughout the United States and four foreign countries.

These machinos work on the principle that germination should always be done in the presence of the three "germination factors" without which accurate results cannot be obtained: (1) moisture, supplied from beneath the seed as in the field, (2) fresh air, (3) proper temperature.

(1) The water from the supply tank on the top of the machine drips through a tube into the gutter or "sub-reservoir" of the upper tray, passes around the tray, thence into the "sub-reservoir" of the tray below, and so on. Moisture from the "sub-reservoirs" is carried up and under the seed through blotters by means of capillary attraction.

(2) The test-chamber is ventilated by a constant supply of fresh air admitted through the drip openings. This retards mold growth and prevents the accumulation of carbon dioxide which would otherwise injure the growth.

(3) An oil lamp suspended below the tester supplies the heat. The gases of combustion pass through the test-chamber in four vertical flues which serve as heating pipes. These cause a circulation of air within the machine which carries the carbon dioxide away from the test-trays.

The Field, Garden or Flower Seed, Seed-Corn or Seed-Grain to be tested is placed upon blotters and then laid on the test-trays. If desired, sawdust, sand, soil or cloth may be used in combination with the blotters, but the principle is always the same. In most cases germination starts very soon after the seed is placed, and the root systems and top sprouts rapidly develop almost in sight of the operator. The patented Indented Test Pads, 100 of which are supplied with each machine, are a great aid in counting, placing, handling, and reading the tests of all small seeds, as with these the seeds may be handled quickly and easily without any danger of mixing or injury. The Standard Seed Tester will frequently start sprouts on Corn, Alfalfa,

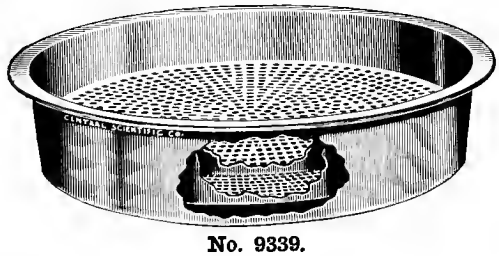
STANDARD SEED TESTERS—Continued

Beans and other seeds within twenty-four hours after the seeds are placed in test, and corn is often leaved out within four days' time. By the Standard method root sprouts are grown on the surface of clean blotters in plain sight of the operator, and their progress may be noted without disturbing the tender plants.

Seedsmen and florists throughout the United States and Canada strongly advocate the use of Seed Testers because they have proved that "it pays to test." Until recently it was the common practice of the seed trade to buy and sell solely on appearance, but today more than one-half of the seedsmen and florists in the United States follow the practice of testing germination of every lot of seed before offering it to their trade, and as a result the seed now offered on the market is of much higher quality than that obtainable a few years ago.

It is to be regretted that many Schools which are supposed to teach practical Agriculture are so far behind the times in this branch. Growing specimens produced within a few hours' time are of greatest value when used to prove and clinch the arguments of a lecture. For class-room use in Botany work, as well as in the study of Agriculture, we know of no device so effective as the Seed Tester which we now offer to our trade.

Catalog No.	Number of Trays	Size Trays, Inches	Seed Corn Capacity, Ears	Capacity, Bus. per week	Base, Inches	Height, Inches	Price, Net
9338B	5	15 x15	500	10 to 12½	23x23	44	$ 30.00
9338C	10	12½x12½	Small seed only	.....	22x22	45	45.00
9338D	5	22½x22½	1125	22½ to 25	32x32	52	60.00
9338E	10	22½x22½	2250	45 to 50	32x32	68	90.00



No. 9339.

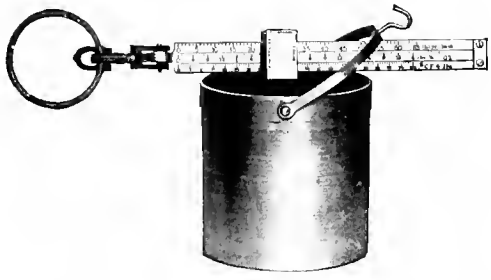
No. 9340.

9339. **CORN TEST SIEVES** according to specifications of the United States Department of Agriculture. The set consists of one sieve with ¼ inch round holes, one sieve with 9/64 inch round holes, and one bottom pan, nested, of brass, 13½ inches in diameter by 3 inches deep. Per set.....Net 4.5(

9339A-E. **SIEVES,** see page 185.

9340. **GRAIN TESTER.** For determining rapidly the farinaceous condition of barley and malt. Fifty kernels may be cut through in a very short time and their interior condition clearly shown.

In use the upper and lower perforated parts are placed together, with the center knife, clearly seen in the illustration, to one side. Grain under test is then shaken into the fifty perforations. After the knife has been pressed into position, cutting through the seeds, the knife and upper perforated sections are slipped away, leaving the cross section of the kernels plainly exposed on the lower section. Handsomely nickel plated..... 8.0(



No. 9341.

No. 9341A.

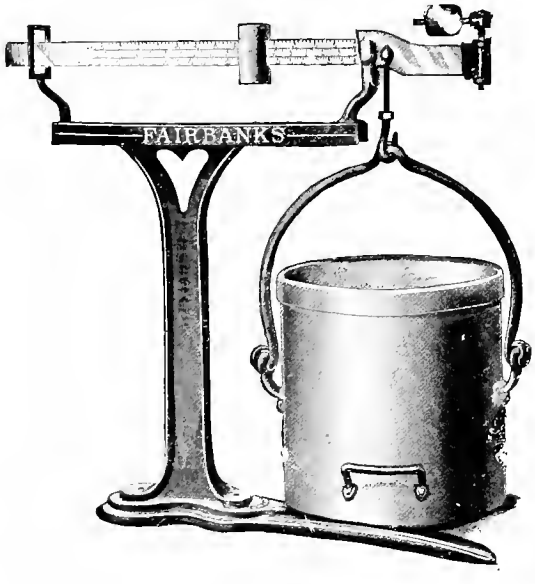
9341. **GRAIN TESTERS**, of best construction, highly polished and lacquered. When cup is empty, the beam balances with the poise set at zero. Beam has three rows of graduations which indicate the number of pounds per bushel of sample, the exact weight of sample, and the percentage of loss in cleaning.

Capacity	1 pt.	1 qt.	2 qt.
Price	$13.00	14.00	15.00

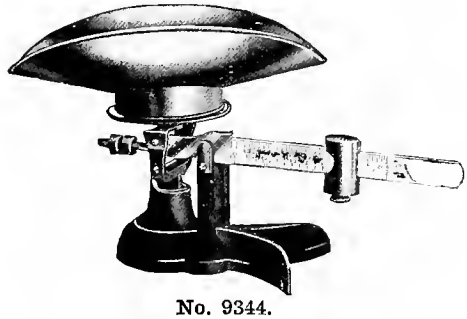
9341A. **GRAIN TESTER FILLERS.** For use with No. 9341 Grain Testers. This device is of special value when accurate testing is desired, since it allows the grain to flow in a uniform stream and insures a uniform density in the cup. Complete with polished steel rod for striking off.

Capacity, quarts	1	2
Price, each	5.50	6.00

Note.—The above fillers may be used with any grain testers of capacity equal to or smaller than that of the filler.



No. 9343.

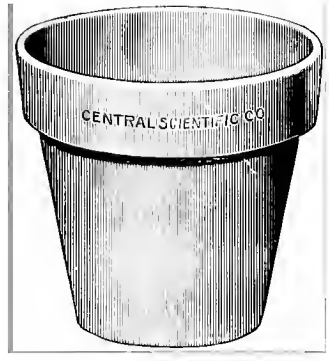


No. 9344.

9343. **GRAIN TESTER**, to indicate weight per bushel of grain or seed by testing in half-bushel measure. Measure of galvanized steel, standard of iron, beam of brass, highly polished. Beam graduated to indicate number of pounds per bushel, actual weight of sample and percentage of loss in cleaning..... $ 32.00

9344. **SEED SCALE (Dirt Scale).** For ascertaining the percentage of dirt in seed. The beam has two rows of marks, the upper indicating the weight, one pound by quarter ounces; the lower the percentage of dirt. In use a sample pound is weighed, sifted, and replaced in the scoop. The poise is then run back until the beam balances. The lower row of marks shows the percentage of loss by dirt removed, i. e., the percentage of dirt contained in the seed. Complete with brass scoop..... 6.00

For **GRAIN AND SEED BALANCES**, see page 127.



No. 9345.

9345. **FLOWER POTS, Earthenware,** standard form, without saucers. These pots are first quality and the strongest made, and because of their lightness and extreme porosity, they are the best growing pots on the market. They have what is commonly known as a "round bottom," which assists the drainage and permits the plants to dump more easily without breaking the ball of earth. Full size inside measure.

Diameter, inches	2	4	6	8
Per dozen	$ 0.11	.20	.55	1.33

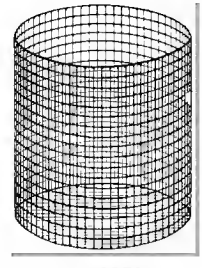
9347. **FLOWER POT SAUCERS,** first quality, to match No. 9345 Flower Pots.

Diameter, inches	3	4	6	8
Per dozen	.12	.17	.33	.60

No. 9349.

9349. **FLOWER POTS, Paper.** The cheapest flower pots on the market. They are made from waterproof fabric, and for lightness, cleanliness and cheapness have no equal. They are absolutely unbreakable, and much lighter in weight than clay.

Height, inches	3	4	5	6
Per 100	.60	1.10	1.75	2.25



No. 9350.

9350. **FLOWER POTS, Wire Gauze,** as described in Farmer's Bulletin No. 257, and Bureau of Soils Circular No. 18. Made of galvanized wire gauze about 3 inches high and 3½ inches in diameter. The construction of these pots has been so planned as to enable the comparison of the action of fertilizers of different kinds and in varying quantities by actual measurements of the transpiration of growing plants. Wire pot only, not paraffined ..... $ 0.20

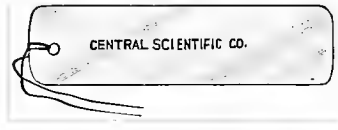
No. 9352.

9352. **PLANT LABEL, Cypress,** for use outside; will last for years. Size 16 x 1¼ inches.
Per dozen ..... $ 0.40
Per hundred 2.50

No. 9354.

No. 9356.

No. 9358.



No. 9359.

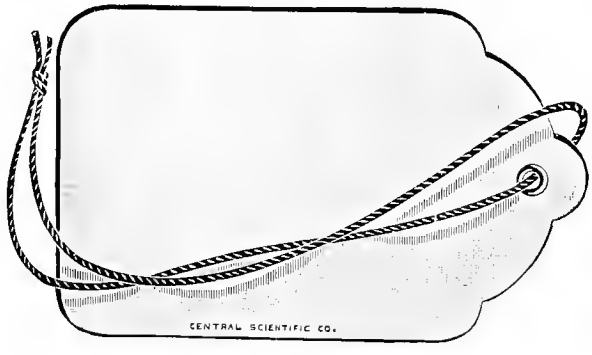
9354. **PLANT LABEL, Iron,** heavily japanned and substantial. Length of stem 7 inches; label 1½ x 2½ inches, protected by mica sheet, and readily removable. Each ..... .20

9356. **PLANT LABEL, Wood,** for pots.

Length, inches	4	6	8
Per hundred	.11	.17	.28

9358. **TREE LABEL, Wood,** ⅝ x 3½ inches, with copper wire. Per hundred ..... .20

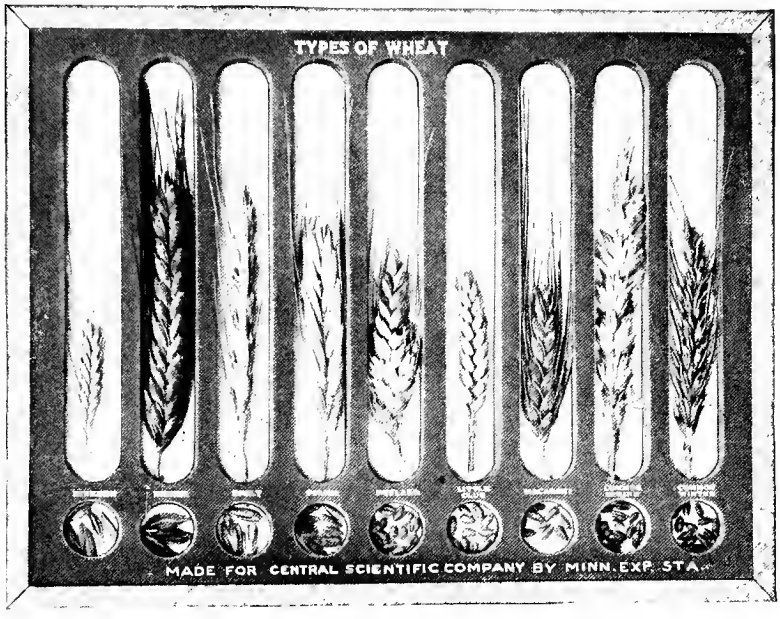
9359. **TREE LABEL, Aluminum,** 1 x 3¾ inches, with copper wire. Per dozen ..... .33



No. 9360 (full size).

9360. **TAG, Paper,** of extra thick tough stock with a fine writing surface. Each tag has a metal eyelet and a loop of the best twine. Per hundred ..... .45

FARM CROPS LABORATORY MATERIAL



No. 9361.

With a view to overcoming the difficulty in securing and keeping properly named specimens of the common farm crops, yet retaining much of the instructional value of the use of the entire specimens, the College of Agriculture of the University of Minnesota has prepared exhibits of a number of crops which are listed below. In addition to the sets Nos. 9361 to 9368 we are prepared to supply bulk laboratory material as furnished by the same source. This includes Ear Corn, Wheat, Barley, etc., both in the head, and as threshed grain, and a number of Grasses, Legumes, and Miscellaneous Plants.

SEED SETS

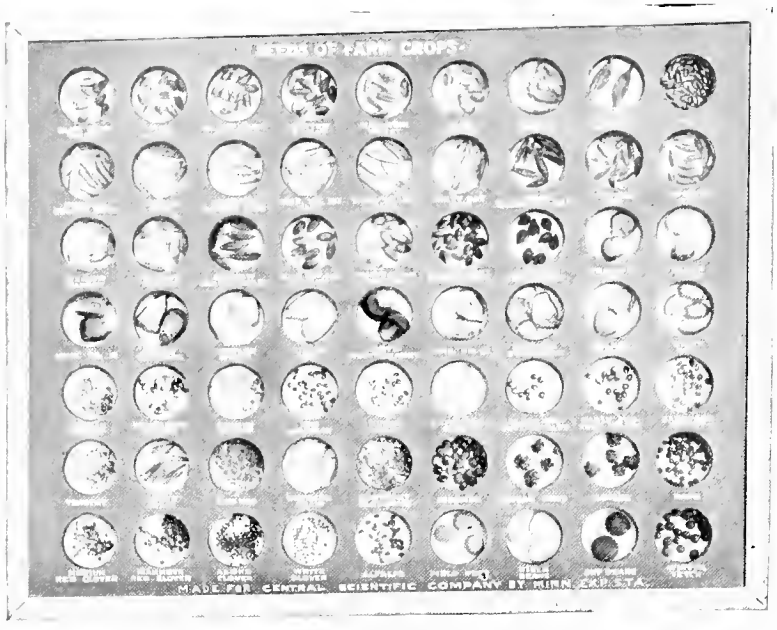
The sets listed below are put up in a neat and substantial case. Heavy cardboard properly punched to receive the material is enclosed between two 8 x 10 inch glass plates which are bound together firmly by a specially made galvanized iron frame so that the sets are as durable as is possible to make them. Each set is provided with a screw-eye to permit hanging. On the back of each case underneath the glass is a printed sheet showing the classification and other concise information regarding the crop or crops. With the material included in the case and the information on the back no other text or reference is necessary for the student to get accurate knowledge of the classification and characteristics of the crops being studied.

9361. **TYPES OF WHEAT.** Spikes and threshed grain of Einkorn, Black Winter Emmer, Bearded Spelt, Polish, Poulard, Bearded Club, Macaroni, Common Spring, Common Winter .....Net $ 1.00

9362. **TYPES OF BARLEY.** Spikes and threshed grain of Six-row Common, True Six-row, White Hull-less, Black Hull-less, Six-row Beardless, Two-row Chevalier, Two-row Imperial, Two-row Hull-less, Two-row Beardless .....Net 1.00

9363. **TYPES OF MILLET.** Spikes and threshed grain of German, Hungarian, Red Siberian, Kursk, White Ural, Black Voronezh, Early Fortune, Barnyard.....Net 1.00

9364. **MISCELLANEOUS PLANTS.** Inflorescence with threshed grain of Winter Rye, Spring Rye, Oats, Blue Dutch Flax, Golden Flax, Japanese Buckwheat, Sorghum, Rice, Cotton, Sudan Grass.....Net 1.00



No. 9365.

9365. **SEEDS OF COMMON FARM CROPS.** Grains only. Wheat, six varieties; Emmer, two varieties; Oats, seven varieties; Rye, two varieties; Barley, five varieties; Buckwheat, two varieties; Corn, eleven varieties; Millet, nine varieties; Grasses, five varieties; Sorghum; Sugar Beets; Mangels; Rape; Clover, four varieties; Alfalfa; Field Peas; Field Beans; Soy Beans; Winter Vetch .....Net $ 1.00

9366. **GRASSES.** Spikes and panicles with threshed seeds; Timothy, Brome Grass, Red Top, Orchard Grass, Kentucky Blue Grass, Canadian Blue Grass, Meadow Fescue, Perennial Rye Grass, Slender Wheat Grass .....Net 1.00

9367. **LEGUMES.** Heads and pods with seeds; Medium Red Clover, Alsike Clover, White Clover, Alfalfa, Sweet Clover, Canada Field Peas, Soy Beans, Winter Vetch, Crimson Clover .....Net 1.00

9368. **ECONOMIC WHEATS.** Spikes and grain: Blue Stem, Fife, Velvet Chaff, Humpback, Durum, Bearded Winter, Smooth Winter, Club, Emmer .....Net 1.00

TYPES AND VARIETIES OF CORN

In the following sets one ear each of the varieties mentioned is furnished.

Note: It is frequently impossible to supply ear corn of a particular variety. In such cases the right to substitute is reserved.

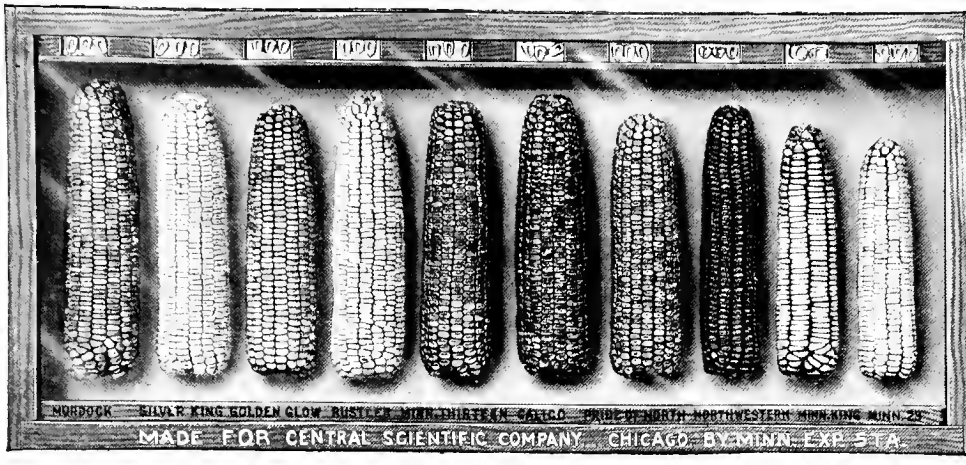
9370A. **POD CORN AND SOFT CORN** (Zea Mays Tunicata and Amylacea). Pod Corn; White Soft; Blue Soft; Mixed Soft. Per set of four ears.....Net .75

9370B. **POP CORN** (Zea Mays Everta). Endosperm Corneous throughout. Includes White Rice; White Rice, Sure Pop; Yellow Rice, Baby Golden; Chocolate Rice; Striped Rice; White Pearl, Mapledale Prolific; White Pearl, Eight Row; Yellow Pearl, Queen's Golden; Black Pearl, Black Beauty; White Rice, Ball; Red Rice. Per set of eleven ears .....Net 2.00

9370C. **FLINT CORN** (Zea Mays Indurata). Small amount of white starchy endosperm enclosed by corneous endosperm. Includes Triumph; Longfellow; Smutnose; Dakota White; Squaw Flint; King Philip. Per set of six ears.....Net .75

9370D. **DENT CORN** (Zea Mays Indentata). White starchy endosperm at center and extending to summit of kernel. Corneous endosperm at sides. Includes Minnesota No. 13; Murdock; Pride of North; Silver King; Rustler White; Minnesota No. 23; Minnesota King; Northwestern Dent; Calico; Gingham; Illinois Red or Bloody Butcher. Per set of eleven ears.....Net 2.00

9370E. **SWEET CORN** (Zea Mays Saccharata). Endosperm more or less wrinkled and translucent in appearance. Includes Golden Bantam; Early Crosby; Stowell's Evergreen; Country Gentleman; Black Mexican; Indian Sweet; Early Minnesota. Per set of seven ears.....Net 1.00


MURDOCK SILVER KING GOLDEN GLOW RUSTLER WHITE THIRTEEN CALICO PRIDE OF NORTH NORTHWESTERN MINN. KING MINN. 23
MADE FOR CENTRAL SCIENTIFIC COMPANY CHICAGO BY MINN. EXP. STA.

No. 9371A.

EAR CORN—MOUNTED SAMPLES

Each set of Ear Corn listed below includes one representative ear of each of the varieties mentioned, mounted in a very neat, substantial, glass-covered, oak case. Kernels as well as ears are shown.

Note: It is frequently impossible to supply good ears of certain varieties of corn. In such cases the right to substitute is reserved.

9371A. **MINNESOTA DENT CORNS.** Includes Silver King; Murdock; Rustler White; Minnesota No. 13; Calico; Golden Glow; Pride of North; Northwestern Dent; Minnesota No. 23; Minnesota King. Per set of ten ears.....Net $ 4.00

9371B. **NORTHERN MINNESOTA CORNS.** Includes Minnesota No. 23; Minnesota King; Pride of North; Northwestern Dent; Longfellow Flint; Smutnose Flint; Triumph Flint; King Philip Flint; Squaw Flint; Dakota Flint. Per set of ten ears....Net 4.00

9371C. **SWEET CORNS.** Includes Stowell's Evergreen; Country Gentleman; Early Crosby; Golden Bantam; Black Mexican; Early Minnesota; Peep o'Day; White Cory; Kendall's Early Giant; Perry's Hybrid. Per set of ten ears.....Net 4.00

9371D. **POP CORNS.** Includes White Pearl; Yellow Pearl; White Pearl, Eight Row; Blue Pearl; White Rice, Sure Pop; Yellow Rice; Red Rice; Striped Rice; Chocolate Rice; Ball. Per set of ten ears.....Net 4.00

9372. **STUDIES IN CORN.** This set consists of typical kernels and parts of ears mounted in a neat metal-bound glass-covered 8 x 10 inch case illustrating points regarding corns that are emphasized in the Minnesota Score Card. Good as well as poor specimens are included. Depth of kernel, space at cob, chaffiness, starchiness, plump tips, adherence of tip cap to cob, adherence of chaff to kernels, color of embryo, size germs, moldiness, blistering, purity, uniformity, shape of kernels, character of dent, etc., are shown and preserved for use indefinitely. Very valuable in connection with the study of corn .....Net 3.50

Nos. 9373L, 9379C, 9375H.

TYPES AND VARIETIES OF WHEAT

HEADS

9373A.	**EINKORN** (Triticum monococcum). Per box of 25 heads	Net	$ 0.20
9373B.	**SPELT** (Triticum spelta), beardless variety. Per box of 25 heads	Net	.20
9373C.	**SPELT** (Triticum spelta), bearded variety. Per box of 25 heads	Net	.20
9373D.	**EMMER** (Triticum dicoccum), bearded white spring variety. Per box of 25 heads	Net	.20
9373E.	**EMMER** (Triticum dicoccum), bearded black winter variety. Per box of 25 heads	Net	.20
9373F.	**COMMON WHEAT** (Triticum sativum vulgare), Blue Stem, beardless spring, with pubescent white glumes. Per box of 25 heads	Net	.20
9373G.	**COMMON WHEAT** (Triticum sativum vulgare), Fife, beardless spring, with smooth white glumes. Per box of 25 heads	Net	.20
9373H.	**COMMON WHEAT** (Triticum sativum vulgare), beardless spring, with smooth red glumes. Per box of 25 heads	Net	.20
9373J.	**COMMON WHEAT** (Triticum sativum vulgare), Velvet Chaff, bearded spring, with smooth white glumes. Per box of 25 heads	Net	.20
9373K.	**COMMON WHEAT** (Triticum sativum vulgare), Humpback, bearded spring, with smooth white glumes. Per box of 25 heads	Net	.20
9373L.	**COMMON WHEAT** (Triticum sativum vulgare), Turkey Red, bearded winter, with smooth white glumes. Per box of 25 heads	Net	.20
9373M.	**COMMON WHEAT** (Triticum sativum vulgare), beardless winter, with smooth red glumes. Per box of 25 heads	Net	.20
9373N.	**COMMON WHEAT** (Triticum sativum vulgare), Fultz, beardless winter, with smooth white glumes. Per box of 25 heads	Net	.20
9373P.	**COMMON WHEAT** (Triticum sativum vulgare), Kharkov, bearded winter, with smooth white glumes. Per box of 25 heads	Net	.20
9373Q.	**CLUB WHEAT** (Triticum sativum compactum), Little Club, beardless, with smooth white glumes. Per box of 25 heads	Net	.20
9373R.	**CLUB WHEAT** (Triticum sativum compactum), Washington Club, bearded. Per box of 25 heads	Net	.20
9373S.	**POULARD WHEAT** (Triticum sativum turgidum), Alaska, bearded spring, with branched spikes and smooth white glumes. Per box of 25 heads	Net	.20
9373T.	**DURUM WHEAT** (Triticum sativum durum), Kubanka, bearded spring, with smooth glumes. Per box of 25 heads	Net	.20
9373U.	**POLISH WHEAT** (Triticum polonicum) Polish, bearded spring, with smooth white glumes. Per box of 25 heads	Net	.20

THRESHED GRAIN

In Screw-capped Bottles.

9374B.	**SPELT** (Triticum spelta), beardless variety. Per 4-ounce bottle	Net	.20
9374C.	**SPELT** (Triticum spelta), bearded variety. Per 4 ounce bottle	Net	.20
9374D.	**EMMER** (Triticum dicoccum), bearded white spring variety. Per 4-ounce bottle	Net	.20
9374E.	**EMMER** (Triticum dicoccum), bearded black winter variety. Per 4-ounce bottle	Net	.20
9374F.	**COMMON WHEAT** (Triticum sativum vulgare), Blue Stem, beardless spring, with pubescent white glumes. Per 4-ounce bottle	Net	.20
9374G.	**COMMON WHEAT** (Triticum sativum vulgare), Fife, beardless spring, with smooth white glumes. Per 4-ounce bottle	Net	.20

No. 9374F.

No. 9376A.

No. 9378A.

No. 9388A.

WHEAT—THRESHED GRAIN—Continued.

9374H. **COMMON WHEAT** (Triticum sativum vulgare), beardless spring, with smooth red glumes. Per 4-ounce bottle.....Net $ 0.20

9374J. **COMMON WHEAT** (Triticum sativum vulgare), Velvet Chaff, bearded spring, with smooth white glumes. Per 4-ounce bottle.....Net .20

9374K. **COMMON WHEAT** (Triticum sativum vulgare), Humpback, bearded spring, with smooth white glumes. Per 4-ounce bottle.....Net .20

9374L. **COMMON WHEAT** (Triticum sativum vulgare), Turkey Red, bearded winter, with smooth white glumes. Per 4-ounce bottle.....Net .20

9374M. **COMMON WHEAT** (Triticum sativum vulgare), beardless winter, with smooth red glumes. Per 4-ounce bottle.....Net .20

9374N. **COMMON WHEAT** (Triticum sativum vulgare), Fultz, beardless winter, with smooth white glumes. Per 4-ounce bottle.....Net .20

9374P. **COMMON WHEAT** (Triticum sativum vulgare), Kharkov, bearded winter, with smooth white glumes. Per 4-ounce bottle.....Net .20

9374Q. **CLUB WHEAT** (Triticum sativum compactum), Little Club, beardless, with smooth white glumes. Per 4-ounce bottle.....Net .20

9374R. **CLUB WHEAT** (Triticum sativum compactum), Washington Club, bearded. Per 4-ounce bottle.....Net .20

9374S. **POULARD WHEAT** (Triticum sativum turgidum), Alaska, bearded spring, with branched spikes and smooth white glumes. Per 4-ounce bottle.....Net .20

9374T. **DURUM WHEAT** (Triticum sativum durum), Kubanka, bearded spring, with smooth glumes. Per 4-ounce bottle.....Net .20

9374U. **POLISH WHEAT** (Triticum polonicum), Polish, bearded spring with smooth white glumes. Per 4-ounce bottle.....Net .20

TYPES AND VARIETIES OF BARLEY

HEADS

9375A. **TRUE SIX-ROW BARLEY** (Hordeum sativum hexastichum pyramidatum), (1) Utah Winter or (2) Reid's Triumph, bearded white. Per box of 25 heads.....Net .25

9375B. **COMMON SIX-ROW BARLEY** (Hordeum sativum vulgare pallidum), Oderbrucker, bearded white. Per box of 25 heads.....Net .25

9375C. **COMMON SIX-ROW BARLEY** (Hordeum sativum vulgare pallidum), Mandscheuri. Per box of 25 heads.....Net .25

9375D. **SIX-ROW BARLEY** (Hordeum sativum vulgare), Black Canadian, bearded black. Per box of 25 heads.....Net .25

9375E. **SIX-ROW BARLEY** (Hordeum sativum vulgare trifurcatum), beardless white hull-less. Per box of 25 heads.....Net .25

9375F. **SIX-ROW BARLEY** (Hordeum sativum vulgare violaceum), bearded black hull-less. Per box of 25 heads.....Net .25

9375G. **SIX-ROW BARLEY** (Hordeum sativum vulgare Horsfordianum), Success Beardless, beardless white. Per box of 25 heads.....Net .25

9375H. **TWO-ROW BARLEY** (Hordeum sativum distichum vulgare nutans), Chevalier, long-bearded white. Per box of 25 heads.....Net .25

9375J. **TWO-ROW BARLEY** (Hordeum sativum distichum erectum), Svanhals, broad-bearded white. Per box of 25 heads.....Net .25

9375K. **TWO-ROW BARLEY** (Hordeum sativum distichum nudum), bearded white hull-less. Per box of 25 heads.....Net .25

9375L. **TWO-ROW BARLEY** (Hordeum sativum distichum), bearded black. Per box of 25 heads.....Net .25

9375M. **TWO-ROW BARLEY** (Hordeum sativum distichum angustispicatum), beardless white. Per box of 25 heads.....Net .25

TYPES AND VARIETIES OF BARLEY

THRESHED GRAIN

In Screw-capped Bottles

9376A. **TRUE SIX-ROW BARLEY** (Hordeum sativum hexastichum pyramidatum), (1) Utah Winter or (2) Reid's Triumph, bearded white. Per 4-ounce bottle.....Net $ 0.25

9376B. **COMMON SIX-ROW BARLEY** (Hordeum sativum vulgare pallidum), Oderbrucker, bearded white. Per 4-ounce bottle.....Net .25

9376C. **COMMON SIX-ROW BARLEY** (Hordeum sativum vulgare pallidum), Mandscheuri. Per 4-ounce bottle.....Net .25

9376D. **SIX-ROW BARLEY** (Hordeum sativum vulgare), Black Canadian, bearded black. Per 4-ounce bottle.....Net .25

9376E. **SIX-ROW BARLEY** (Hordeum sativum vulgare trifurcatum), beardless white hull-less. Per 4-ounce bottle.....Net .25

9376F. **SIX-ROW BARLEY** (Hordeum sativum vulgare violaceum), bearded black hull-less. Per 4-ounce bottle.....Net .25

9376G. **SIX-ROW BARLEY** (Hordeum sativum vulgare Horsfordianum), Success Beardless, beardless white. Per 4-ounce bottle.....Net .25

9376H. **TWO-ROW BARLEY** (Hordeum sativum distichum vulgare nutans), Chevalier, long-bearded white. Per 4-ounce bottle.....Net .25

9376J. **TWO-ROW BARLEY** (Hordeum sativum distichum erectum), Svauhals, broad-bearded white. Per 4-ounce bottle.....Net .25

9376K. **TWO-ROW BARLEY** (Hordeum sativum distichum nudum), bearded white hull-less. Per 4-ounce bottle.....Net .25

9376L. **TWO-ROW BARLEY** (Hordeum sativum distichum), bearded black. Per 4-ounce bottle.....Net .25

TYPES AND VARIETIES OF OATS

PANICLES

9377A. **WHITE OATS** (Avena sativa), spreading panicle, medium maturing. Improved Ligowa, Minnesota No. 281. Per box of 25 panicles.....Net .30

9377B. **WHITE OATS** (Avena sativa), spreading panicle, medium maturing. Swedish Select. Per box of 25 panicles.....Net .30

9377C. **YELLOW OATS** (Avena sativa), spreading panicle, early maturing. Sixty-day Minnesota No. 261. Per box of 25 panicles.....Net .30

9377D. **YELLOW OATS** (Avena sativa), spreading panicle, early maturing. Kherson. Per box of 25 panicles.....Net .30

9377E. **BLACK OATS** (Avena sativa), spreading panicle, medium maturing. Per box of 25 panicles.....Net .30

9377F. **WHITE OATS** (Avena sativa), side panicle, medium maturing. Per box of 25 panicles.....Net .30

9377G. **WHITE OATS** (Avena sativa), side panicle, late maturing, White Russian. Per box of 25 panicles.....Net .30

9377H. **BLACK OATS** (Avena sativa), side panicle, medium maturing. Per box of 25 panicles.....Net .30

9377J. **WILD OATS** (Avena fatua). Per box of 25 panicles.....Net .30

THRESHED GRAIN

In Screw-capped Bottles.

9378A. **WHITE OATS** (Avena sativa), spreading panicle, medium maturing. Improved Ligowa, Minnesota No. 281. Per 4-ounce bottle.....Net .20

9378B. **WHITE OATS** (Avena sativa), spreading panicle, medium maturing. Swedish Select. Per 4-ounce bottle.....Net .20

9378C. **YELLOW OATS** (Avena sativa), spreading panicle, early maturing. Sixty-day Minnesota No. 261. Per 4-ounce bottle.....Net .20

9378D. **YELLOW OATS** (Avena sativa), spreading panicle, early maturing. Kherson. Per 4-ounce bottle.....Net .20

9378E. **BLACK OATS** (Avena sativa), spreading panicle, medium maturing. Per 4-ounce bottle.....Net .20

9378F. **WHITE OATS** (Avena sativa) side panicle, medium maturing. Per 4-ounce bottle.Net .20

9378G. **WHITE OATS** (Avena sativa), side panicle, late maturing. White Russian. Per 4-ounce bottle.....Net .20

9378H. **BLACK OATS** (Avena sativa), side panicle, medium maturing. Per 4-ounce bottle.Net .20

TYPES AND VARIETIES OF MILLET

HEADS

9379A.	**PEARL MILLET** (Pennisetum glaucum). Per box of 4 heads	Net	$ 0.30
9379B.	**COMMON MILLET** (Setaria italica). Per box of 25 heads	Net	.30
9379C.	**HUNGARIAN MILLET** (Setaria italica). Per box of 25 heads	Net	.30
9379D.	**GERMAN MILLET** (Setaria italica). Per box of 25 heads	Net	.30
9379E.	**RED SIBERIAN MILLET** (Setaria italica). Per box of 25 heads	Net	.30
9379F.	**KURSK MILLET** (Setaria italica). Per box of 25 heads	Net	.30
9379G.	**EARLY FORTUNE MILLET** (Panicum miliaceum). Per box of 25 heads	Net	.30
9379H.	**RED TURGHAI MILLET** (Panicum miliaceum). Per box of 25 heads	Net	.30
9379J.	**RED RUSSIAN MILLET** (Panicum miliaceum). Per box of 25 heads	Net	.30
9379K.	**WHITE URAL MILLET** (Panicum miliaceum). Per box of 25 heads	Net	.30
9379L.	**BLACK VORONEZH MILLET** (Panicum miliaceum). Per box of 25 heads	Net	.30
9379M.	**JAPANESE BARNYARD MILLET** (Echinochloa frumentacea). Per box of 25 heads	Net	.30

THRESHED MATERIAL

In Screw-capped Bottles.

9380A.	**PEARL MILLET** (Pennisetum glaucum). Per 2-ounce bottle	Net	.20
9380B.	**COMMON MILLET** (Setaria italica). Per 2-ounce bottle	Net	.20
9380C.	**HUNGARIAN MILLET** (Setaria italica). Per 2-ounce bottle	Net	.20
9380D.	**GERMAN MILLET** (Setaria italica). Per 2-ounce bottle	Net	.20
9380E.	**RED SIBERIAN MILLET** (Setaria italica). Per 2-ounce bottle	Net	.20
9380F.	**KURSK MILLET** (Setaria italica). Per 2-ounce bottle	Net	.20
9380G.	**EARLY FORTUNE MILLET** (Panicum miliaceum). Per 2-ounce bottle	Net	.20
9380H.	**RED TURGHAI MILLET** (Panicum miliaceum). Per 2-ounce bottle	Net	.20
9380J.	**RED RUSSIAN MILLET** (Panicum miliaceum). Per 2-ounce bottle	Net	.20
9380K.	**WHITE URAL MILLET** (Panicum miliaceum). Per 2-ounce bottle	Net	.20
9380L.	**BLACK VORONEZH MILLET** (Panicum miliaceum). Per 2-ounce bottle	Net	.20
9380M.	**JAPANESE BARNYARD MILLET** (Echinochloa frumentacea). Per 2-oz. bottle	Net	.20

TYPES OF GRASSES

UNTHRESHED MATERIAL

9381A.	**TIMOTHY** (Phleum pratense). Per box of 25 heads	Net	.30
9381B.	**BROME GRASS** (Bromus inermis). Per box of 25 heads	Net	.30
9381C.	**RED TOP** (Agrostis alba var. vulgaris). Per box of 25 heads	Net	.30
9381D.	**ORCHARD GRASS** (Dactylis glomerata). Per box of 25 heads	Net	.30
9381E.	**KENTUCKY BLUE GRASS** (Poa pratensis). Per box of 25 heads	Net	.30
9381F.	**CANADA BLUE GRASS** (Poa compressa). Per box of 25 heads	Net	.30
9381G.	**MEADOW FESCUE** (Festuca elatior var. pratensis). Per box of 25 heads	Net	.30
9381H.	**PERENNIAL RYE GRASS** (Lolium perenne). Per box of 25 heads	Net	.30
9381J.	**SLENDER WHEAT GRASS** (Agropyron tenerum). Per box of 25 heads	Net	.30

THRESHED MATERIAL

In Screw-capped Bottles.

9382A.	**TIMOTHY** (Phleum pratense). Per 2-ounce bottle	Net	.15
9382B.	**BROME GRASS** (Bromus inermis). Per 2-ounce bottle	Net	.15
9382C.	**RED TOP** (Agrostis alba var. vulgaris). Per 2-ounce bottle	Net	.15
9382D.	**ORCHARD GRASS** (Dactylis glomerata). Per 2-ounce bottle	Net	.15
9382E.	**KENTUCKY BLUE GRASS** (Poa pratensis). Per 2-ounce bottle	Net	.15
9382F.	**CANADA BLUE GRASS** (Poa compressa). Per 2-ounce bottle	Net	.15
9382G.	**MEADOW FESCUE** (Festuca elatior var. pratensis). Per 2-ounce bottle	Net	.15
9382H.	**PERENNIAL RYE GRASS** (Lolium perenne). Per 2-ounce bottle	Net	.15
9382J.	**SLENDER WHEAT GRASS** (Agropyron tenerum). Per 2-ounce bottle	Net	.15

LEGUMES

HEADS

9383A.	**MEDIUM RED CLOVER** (Trifolium pratense). Per box of 25 heads	Net	.30
9383B.	**ALSIKE CLOVER** (Trifolium hybridum). Per box of 25 heads	Net	.30
9383C.	**WHITE CLOVER** (Trifolium repens). Per box of 25 heads	Net	.30
9383D.	**COMMON ALFALFA** (Medicago sativa). Per box of 25 heads	Net	.30
9383E.	**WHITE SWEET CLOVER** (Melilotus alba). Per box of 25 heads	Net	.30

LEGUMES—THRESHED SEED

In Screw-capped Bottles

9384A.	**MEDIUM RED CLOVER** (Trifolium pratense). Per 2-ounce bottle	Net	$ 0.15
9384B.	**ALSIKE CLOVER** (Trifolium hybridum). Per 2-ounce bottle	Net	.15
9384C.	**WHITE CLOVER** (Trifolium repens). Per 2-ounce bottle	Net	.15
9384D.	**COMMON ALFALFA** (Medicago sativa). Per 2-ounce bottle	Net	.15
9384E.	**WHITE SWEET CLOVER** (Melilotus alba), seed in hull. Per 2-ounce bottle	Net	.15
9384F.	**CRIMSON CLOVER** (Trifolium incarnatum). Per 2-ounce bottle	Net	.15
9384G.	**WHITE CANADA FIELD PEAS** (Pisium sativum var. arvense), medium. Per 2-ounce bottle	Net	.15
9384H.	**GOLDEN VINE FIELD PEAS** (Pisium sativum var. arvense), early. Per 2-ounce bottle	Net	.15
9384J.	**SOY BEANS** (Glysine hispeda). Per 2-ounce bottle	Net	.15
9384K.	**WINTER VETCH** (Vicia villosa). Per 2-ounce bottle	Net	.15
9384L.	**COW PEAS** (Vigna sinensis). Per 2-ounce bottle	Net	.15

TYPES AND VARIETIES OF SORGHUM

(ANDROPOGON SORGHUM)

HEADS

9385A.	**SUDAN GRASS.** Per box of 10-15 heads	Net	.20
9385B.	**AMBER SORGHUM.** Per box of 1 head	Net	.20
9385C.	**WHITE AMBER SORGHUM.** Per box of 1 head	Net	.20
9385D.	**SUMAC SORGHUM.** Per box of 1 head	Net	.20
9385E.	**ORANGE SORGHUM.** Per box of 1 head	Net	.20
9385F.	**RED KAFFIR.** Per box of 1 head	Net	.20
9385G.	**BLACK HULLED WHITE KAFFIR.** Per box of 1 head	Net	.20
9385H.	**PINK KAFFIR.** Per box of 1 head	Net	.20
9385J.	**MILO.** Per box of 1 head	Net	.20
9385K.	**FETERITA.** Per box of 1 head	Net	.20
9385L.	**WHITE DURRA.** Per box of 1 head	Net	.20
9385M.	**BROWN DURRA.** Per box of 1 head	Net	.20
9385N.	**NEW SHALLU.** Per box of 1 head	Net	.20
9385P.	**RED KOWLIANG.** Per box of 1 head	Net	.20
9385Q.	**STANDARD BROOM CORN.** Per box of 1 head	Net	.20
9385R.	**DWARF BROOM CORN.** Per box of 1 head	Net	.20

THRESHED MATERIAL

In Screw-capped Bottles

9386A.	**SUDAN GRASS.** Per 4-ounce bottle	Net	.25
9386B.	**AMBER SORGHUM.** Per 4-ounce bottle	Net	.25
9386C.	**WHITE AMBER SORGHUM.** Per 4-ounce bottle	Net	.25
9386D.	**SUMAC SORGHUM.** Per 4-ounce bottle	Net	.25
9386E.	**ORANGE SORGHUM.** Per 4-ounce bottle	Net	.25
9386F.	**RED KAFFIR.** Per 4-ounce bottle	Net	.25
9386G.	**BLACK HULLED WHITE KAFFIR.** Per 4-ounce bottle	Net	.25
9386H.	**PINK KAFFIR.** Per 4-ounce bottle	Net	.25
9386J.	**MILO.** Per 4-ounce bottle	Net	.25
9386K.	**FETERITA.** Per 4-ounce bottle	Net	.25
9386L.	**WHITE DURRA.** Per 4-ounce bottle	Net	.25
9386M.	**BROWN DURRA.** Per 4-ounce bottle	Net	.25
9386N.	**NEW SHALLU.** Per 4-ounce bottle	Net	.25
9386P.	**RED KOWLIANG.** Per 4-ounce bottle	Net	.25
9386Q.	**STANDARD BROOM CORN.** Per 4-ounce bottle	Net	.25
9386R.	**DWARF BROOM CORN.** Per 4-ounce bottle	Net	.25

MISCELLANEOUS PLANTS

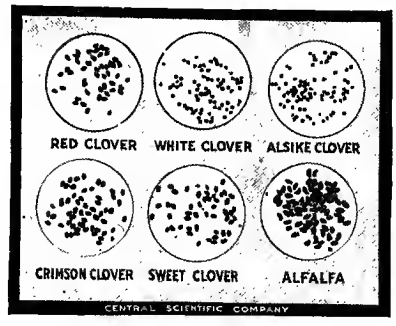
HEADS

9387A.	**WINTER RYE,** Swedish Minnesota No. 2. Per box	Net	.20
9387B.	**SPRING RYE.** Per box	Net	.20
9387C.	**FLAX,** Blue Blossomed Dutch, Minnesota No. 25. Per box	Net	.20
9387D.	**JAPANESE BUCKWHEAT.** Per box	Net	.20
9387E.	**SILVERHULL BUCKWHEAT.** Per box	Net	.20
9387F.	**RICE.** Per box	Net	.20
9387G.	**COTTON.** Per box	Net	.20

Note.—The number of heads per box of the above miscellaneous plants varies from six to twenty-five.

THRESHED GRAIN

9388A. **WINTER RYE,** Swedish Minnesota No. 2. Per 4-ounce bottle.....Net $ 0.20
9388B. **SPRING RYE.** Per 4-ounce bottle.....Net .20
9388C. **FLAX,** Blue Blossomed Dutch, Minnesota No. 25. Per 4-ounce bottle.....Net .20
9388D. **JAPANESE BUCKWHEAT.** Per 4-ounce bottle .....Net .20
9388E. **SILVER HULL BUCKWHEAT.** Per 4-ounce bottle.....Net .20
9388F. **RICE.** Per 4-ounce bottle.....Net .20
9388G. **COTTON.** Per 4-ounce bottle.....Net .20
For **SQUARE BOTTLES** only see page 90.
9389A, F, G, R. **WEED** and **PLANT DISEASE SPECIMENS,** see page 186.



No. 9390A.

SEED SPECIMENS

FOR EXAMINATION UNDER SIMPLE MICROSCOPE.

The sets of seeds listed below are mounted between two lantern slide plates, and are therefore especially well adapted for low power microscopical examination, since an abundance of illumination can be obtained from below. The seeds included are mainly those of clover, grasses and common weeds, and as they are put up under the direction of a prominent agriculturist at one of the large State Universities, their satisfactory character is assured. Both the common and the botanical names of the specimens are printed below them on both sides of the card.

9390A. **LEGUMES** .....Net $ 0.35

Red Clover	**White Clover**	**Crimson Clover**
Trifolium pratense	Trifolium repens	Trifolium incarnatum
Alsike Clover	**Alfalfa**	**Sweet Clover**
Trifolium hybridum	Medicago Sativa	Melilotus alba

9390B. **WEEDS** .....Net .35

Yellow Trefoil	**Dodder**	**Mustard**
Medicago lupulina	Cuscuta arvensis	Brassica nigra
Crab Grass	**Buckhorn**	**Broad Plantain**
Syntherisma linearis	Plantago lanceolata	Plantago rugelii

9390C. **WEEDS** .....Net .35

Dock	**Pigweed**	**Lamb's-quarter**
Rumex crispus	Amaranthus retroflexus	Chenapodium album
Moth Mullein	**Ragweed**	**Wild Carrot**
Verbascum blattaria	Ambrosia artemisioefolia	Daucus carota

9390D. **WEEDS** .....Net .35

Old Witch Grass	**Chicory**	**Sorrel**
Panicum capillare	Cichorium intybus	Rumex acetossella
Smartweed	**Vervain**	**Canada Thistle**
Polygonum lapothifolium	Verbena hastata	Carduus arvensis

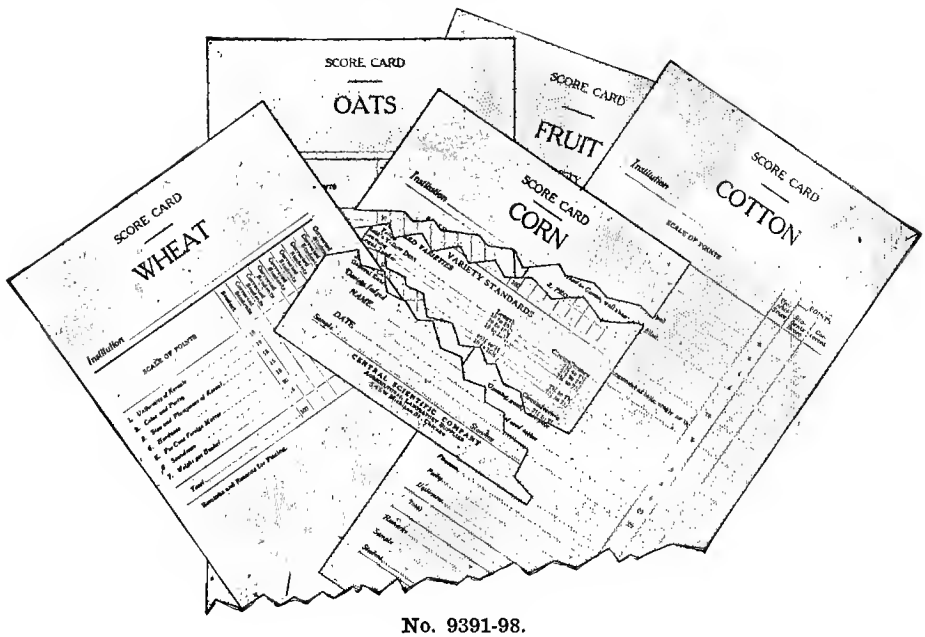
9390E. **GRASSES** .....Net .35

Smooth Brome	**Bermuda**	**Orchard**
Bromus inermis	Capriola dactylon	Dactylis glomerata
Tall Oat	**Italian Rye**	**Perennial Rye**
Arrhenatherum elatius	Lolium italicum	Lolium perenne

9390F. **GRASSES** .....Net .35

Redtop	**Sheep's Fescue**	**Kentucky Blue**
Agrostis alba	Festuca ovina	Poa pratensis
Timothy	**Meadow Fescue**	**Canada Blue**
Phleum pratense	Festuca elatior pratensis	Poa compressa

For **MATERIALS FOR MOUNTING SEED SPECIMENS,** see page 187.



No. 9391-98.

SCORE CARDS

In the judging of grains, fruits and vegetables our Score Cards will be found more than a convenience—they will be found indispensable when once used. They are a saving in time, and in addition direct the student's attention to points which are often neglected when judging different samples. The low price should put an equipment in every school. Each subject is put up in tablets of 50 sheets.

9391.	**SCORE CARD, Barley.** Per tablet of 50 sheets	$ 0.20
9392.	**SCORE CARD, Corn.** Per tablet of 50 sheets	.20
9393.	**SCORE CARD, Cotton.** Per tablet of 50 sheets	.20
9394.	**SCORE CARD, Flax.** Per tablet of 50 sheets	.20
9395.	**SCORE CARD, Fruit.** Per tablet of 50 sheets	.20
9396.	**SCORE CARD, Oats.** Per tablet of 50 sheets	.20
9397.	**SCORE CARD, Potatoes.** Per tablet of 50 sheets	.20
9398.	**SCORE CARD, Wheat.** Per tablet of 50 sheets	.20

For **CHARTS** of **CORN** and **WHEAT**, see page 189.

SUNDRIES

SPROUTING MEDIA

PROPAGATING SAND, best quality, clean and fertile. Per peck	.50
SAWDUST, for germinating trays, specially selected. Per peck	.25
SPHAGNUM MOSS, best quality, for germinating boxes. Per lb	.25

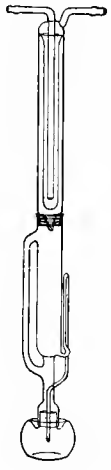
FERTILIZERS

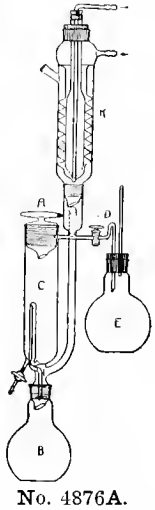
	Prices Net.	
	5 lb.	25 lb.
Acid Phosphate	$ 0.35	$ 1.25
Bone Meal	.25	1.00
Dried Blood	.40	1.50
Guano	.40	1.50
Gypsum (see **Land Plaster**).		
Kainit	.20	.65
Land Plaster (Gypsum)	.15	.50
Muriate of Potash	.35	1.50
Nitrate of Soda	.35	1.50
Rock Phosphate	25	.75
Sulphate of Ammonia	40	1.75
Sulphate of Potash	5	1.75

9399. **PERFECT PLANT FOOD** in compressed tablets, according to the formula of Prof. Julius von Sachs. Per box of 25 ..... Net .10

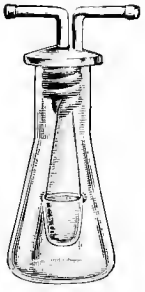
EXTRACTION APPARATUS

No. 4875.


No. 4876.



No. 4876A.


No. 4876B.

4875. **EXTRACTION APPARATUS, Soxhlet's,** complete, consisting of flask, extractor, and Allihn's condenser; adapted for extraction of fat in milk analysis.

Capacity to top of siphon, c. c.	60	100	200
S. & S. extraction shells to be used, mm.	22x80	33x80	43x123
Complete as above without shells	$2.75	3.00	3.75

4875A. **EXTRACTION TUBES** only of No. 4875.

Capacity, c. c.	60	100	200
Each	1.10	1.35	2.10

4875B. **EXTRACTION APPARATUS,** see page 192.

4876. **EXTRACTION APPARATUS, Soxhlet's,** with Hopkins' inner cooled condenser, with ground-in joint, extraction tube, and Knorr's mercury sealed flask, making an ideal combination, as the condensation is more rapid and no moisture gathers on outside.

Capacity to top of siphon, c. c.	60	100
Each	4.00	5.00

4876A. **EXTRACTION APPARATUS, Friedrichs'.** (Journal of the American Chemical Society, Volume XXXIV, No. 11, 1912.) This new form has the following advantages:

1. The condenser may be rigidly connected with the water supply.
2. The extraction and also the recovery of the solvent by distillation may be accomplished in the same apparatus.
3. The manipulation of the apparatus is convenient and rapid.
4. Danger of breakage is reduced as the apparatus may be fixed securely and only the perforated stopper and flask need be removed.
5. The reflux screw condenser insures efficient condensation with minimum amount of water.

Complete with five flasks of resistance glass ..... $ 12.50

4876B. **EXTRACTION APPARATUS, Underwriters' Laboratories Pattern.** See Journal of Industry and Engineering, Chemical Volume IV, No. 7, June, 1912. A rapid and simple form; the apparatus consists of a reflux condenser made of a spiral metal tube, from which is suspended a porcelain Gooch crucible. This system is placed in a wide, long necked, conical flask as illustrated. As the entire apparatus is only 6 inches high and 3 inches wide, it takes a minimum amount of space. This form conforms to the Underwriters' Standard Specifications for testing rubber compounds... 2.25

No. 4877.

No. 4877B.

No. 4877R.

4877. **EXTRACTION APPARATUS, Knorr's**, as modified by Walter & Goodrich (Circ. No. 69, Bureau of Chem., United States Department of Agriculture). Complete with condenser and adapter, extraction tube with perforated nickel lower disk, and flask for mercury seal, but without spring or upper perforated disk ..... $ 4.35

4877A. **CONDENSER** of No. 4877, with adapter sealed on 3.00

4877B. **EXTRACTION TUBE** of No. 4877, without perforated disk ..... .45

4877C. **SPRING** for No. 4877 ..... .25

4877D. **DISK, Upper,** for No. 4877, of nickel ..... .25

4877E. **DISK, Upper,** for No. 4877, of platinum ..... Market price

4877F. **DISK, Lower,** for No. 4877, of nickel ..... .30

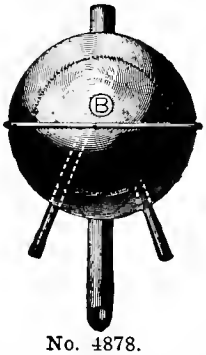
4877G. **DISK, Lower,** for No. 4877, of platinum ..... Market price

4877H. **FLASKS,** only, for No. 4877, with holes in neck for return flow of ether ..... .60

4877J. **FLASKS, Sy,** only, for No. 4877, with holes in neck for return flow of ether ..... .60

4877P. **EXTRACTION APPARATUS, Knorr's,** original form. Complete with No. 4908 Flask, 100 c.c., No. 4877A Condenser, and No. 4877R Extraction Tube 5.75

4877R. **EXTRACTION TUBE, Knorr's,** original form, with perforated platinum disc sealed in 2.50



No. 4878.

No. 4908.

4878. **CONDENSER, Soxhlet's,** globe-shaped, copper, nickel-plated, tinned inside, 4-inch diameter 2.70

4879. **EXTRACTION SHELLS, Paper,** of Fat Free Paper, for extraction apparatus, Schleicher & Schuell's, seamless, so that it is impossible for any of the substance to find its way into the solution. These shells can be used repeatedly.

Diameter, mm.	22	33	43
Length, mm.	80	80	123
Each ..... Net	.09	.10	.20
Per box of 25 ..... Net	1.65	1.85	3.70

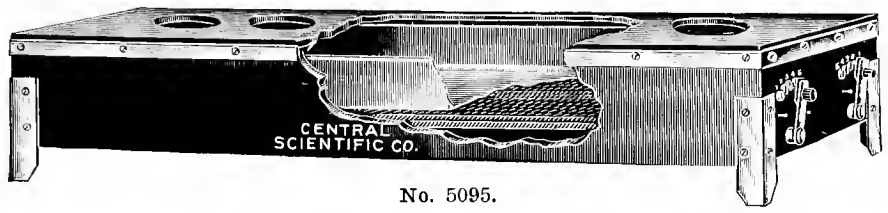
4879B. **EXTRACTION SHELLS, Glass,** easily cleaned, may be used repeatedly, and exact weight determined. Length, 80 mm.

Diameter, mm.	22	33
Each	.30	.42

4879C. **EXTRACTION SHELLS,** see page 192.

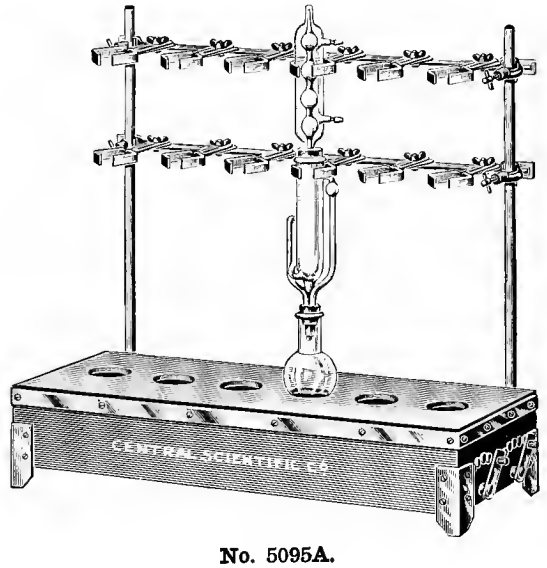
4908. **EXTRACTION FLASKS, Knorr's,** for mercury seal.

Capacity, c.c.	60	100
Each	.30	.42



No. 5095.

5095. **ELECTRIC HEATER** for Extraction Apparatus (after designs by Prof. W. H. Ross of the University of Arizona). A box 80 x 20 x12 cm. of asbestos board, containing a system of resistance coils, above which is supported a sheet iron pan. The top of the outer box is removable and has six openings through which pass the flasks of the extraction apparatus which rest on the bottom of the iron pan below. The flasks thus rest on a hot plate and are surrounded by a heated atmosphere so that little current is needed. A simple switch arrangement permits the use of currents of from 1 to 4 amperes at 110 volts, the change from minimum to maximum being made in 15 steps if desired. This gives a wide range of temperature so that not only ether but acetone, chloroform and other solvents may be used. After extraction the solvent may be evaporated without danger of ignition. With top removed the heater becomes an ordinary hot plate. By placing a liquid in the iron box the heater becomes a liquid bath. Complete with covers for holes..... $ 27.75

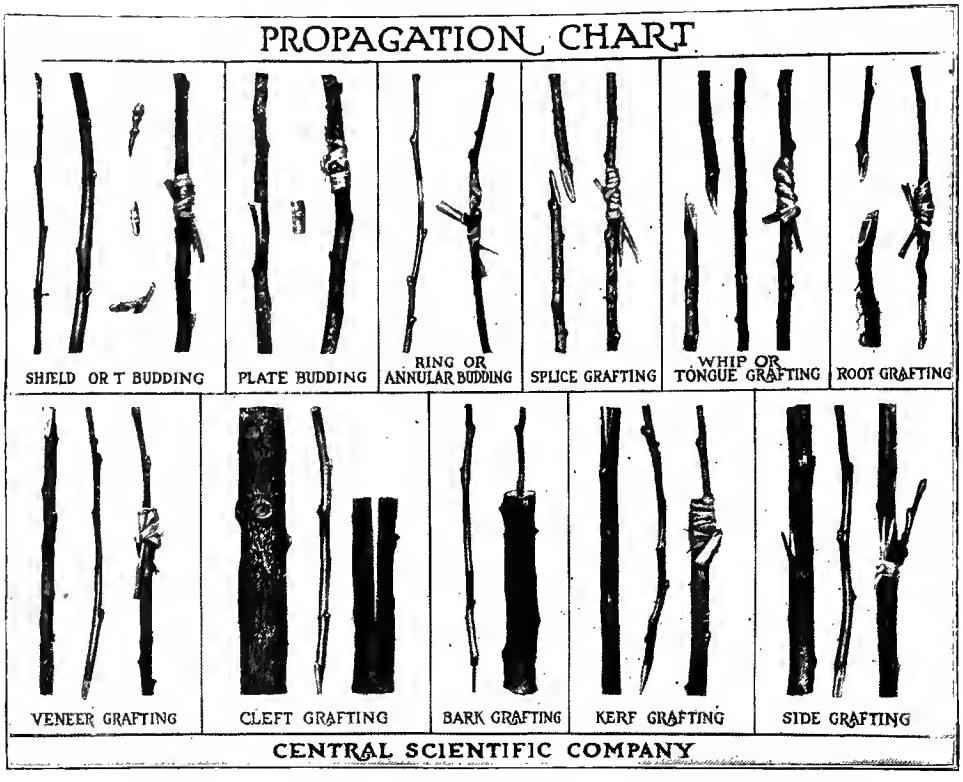


No. 5095A.

5095A. **CENCO ELECTRIC HEATER** for extractions. This is No. 5095 Electric Heater provided with supports adjustable in height, having clamps for each extractor and condenser. The flasks may be located as in the illustration, or they may rest upon the hot plate below the cover.....Net 40.00

5095B. **ELECTRIC HEATER** for extractions. Similar in general construction to No. 5095A, but provided with six 110 volt electric lamps instead of the system of heating coils (so that the wide range of temperatures is not available), and without the iron tray...Net 30.00

TREE HUSBANDRY



No. 9400.

9400. **PROPAGATION CHART.** A set of miniature models of natural wood, 6 inches long, representing the better and more common forms of budding and grafting. This chart will be found of great value to anyone teaching horticulture and the propagation of plants, since the models represent the work as it is actually done in the field and are, therefore, of much more value for purposes of demonstration and explanation than ordinary illustrations and written descriptions.

The models are mounted upon heavy cardboard, 20 x 36 inches, to which they are so securely wired by an ingenious device that there is little danger of their becoming displaced from their proper position.

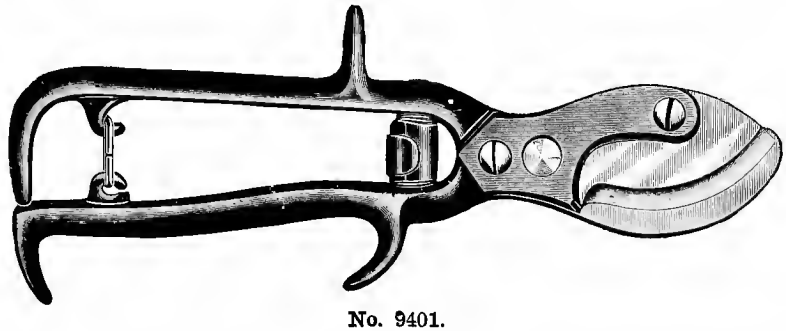
The woods used in the models represent, so far as is possible, woods of the proper age to use in actual work and they appear just as they come from the orchard, except that they are coated with shellac for the purpose of preservation.

The following forms of propagation are represented:

Shield or T Budding.
Plate Budding.
Ring or Annular Budding.
Splice Grafting.
Whip or Tongue Grafting.
Root Grafting.
Veneer Grafting.
Cleft Grafting.
Bark Grafting.
Kerf Grafting.
Side Grafting.

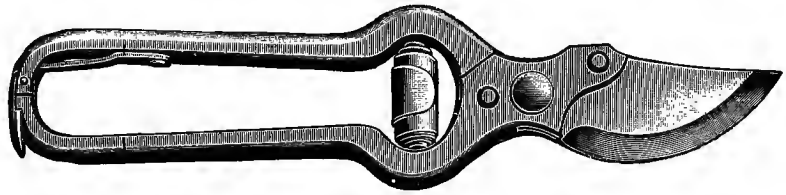
Brief descriptions are printed beneath each method of propagation, so that the chart is self-explanatory. For example, "Cleft Grafting, the more common form of retopping old trees or changing the variety of the fruit borne by the tree. Usually but two scions are placed in each stock." ..... $ 4.00

PRUNING, BUDDING, GRAFTING, PROPAGATING TOOLS



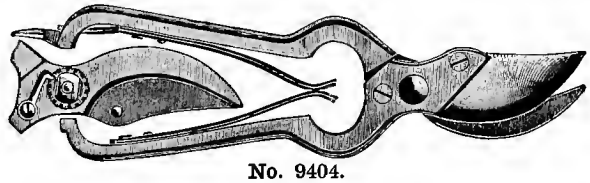
No. 9401.

9401. **PRUNING SHEARS, Henry's Pattern,** good quality steel blade, tempered and polished, with brace at back, black japanned handle, volute spring. These shears are well adapted for grape pruning and where light pruning is desired on small shrubs and trees. 8½ inches long..... $ 0.40



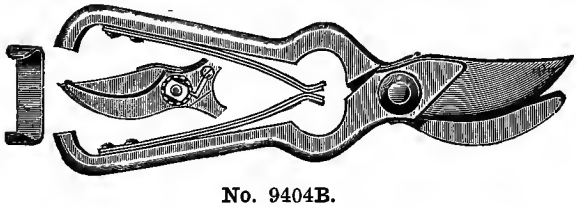
No. 9403.

9403. **PRUNING SHEARS, California Pattern,** hand forged, polished tool steel blade, lock nut, volute spring, malleable iron handle. These shears allow the pruner to make an upward close cut, thus making a wound which will soon heal over. Well adapted for vineyard or home orchard pruning. 9 inches long..... .40

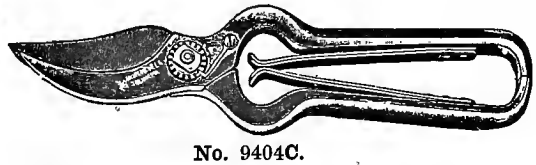


No. 9404.

9404. **PRUNING SHEARS, California Pattern,** hand forged tool steel blade, full polished, lock nut, regulating ratchet, double brass spring. Many pruners prefer the double brass spring on account of the ease of operating. These shears are well adapted for regular orchard pruning and will give good service. 9 inches long..... 1.00



No. 9404B.



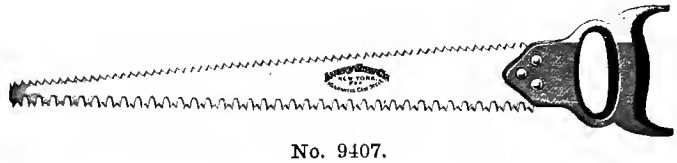
No. 9404C.

9404B. **PRUNING SHEARS, California Pattern,** fully polished, double brass spring, adjustable lock nut. Each shear is supplied with one extra blade. A low price tool very suitable for heavy work. (Those desiring a similar tool of higher grade are referred to No. 9404C below.) 9 inches long..... 1.65

9404C. **PRUNING SHEARS, California Pattern,** Henckel's Twin Brand, finest quality, fully polished, double brass spring, ratchet regulating bolt, each shear supplied with one extra blade. **Every pruner in a commercial orchard should have one of these high class pruning shears.** They are not only durable but they enable one to do the best of pruning work. By having the extra blade the pruner can always keep these shears in perfect condition. 8½ inches long..... 2.75

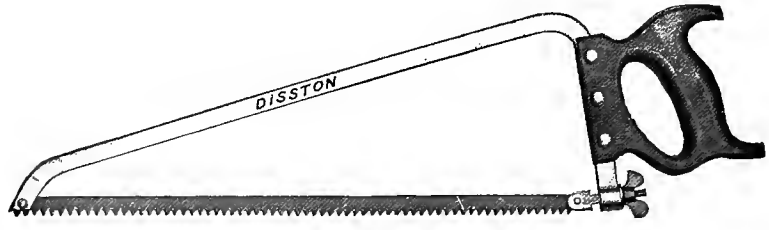
No. 9405.

9405. **PRUNING SAW**, crucible steel, grained blade, apple handle, polished edge, three screws. This saw is well adapted for making large cuts on either shade or fruit trees. There is no danger of injury by bruising the bark on the remaining branch by using this saw. The teeth can be set so that this saw will cut either green or dead wood. 20 inches long ..... $ 1.00



No. 9407.

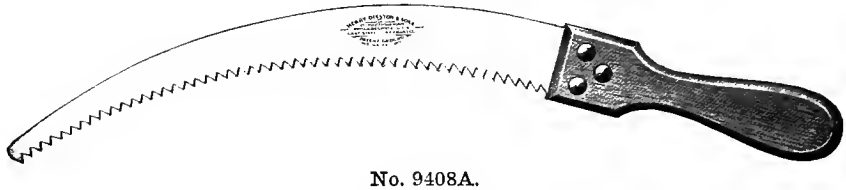
9407. **PRUNING SAW** for shade trees, double edge, beech handle, three screws. One edge is designed for cutting off live or green wood branches and the other edge for removing dead branches. 18 inches long ..... .75



No. 9408.

9408. **PRUNING SAW**, flat steel back, narrow tapered point, extra large handle for use with gloved hand, blued steel blade. This saw is designed for making clean close cuts in tight places, such as cutting out branches in crotches of fruit trees. 18½ inches long 1.25

EXTRA BLADES for No. 9408 Pruning Saw, each ..... .15



No. 9408A.

9408A. **PRUNING SAW**, crescent shape, crucible steel blade, beech handle, three screws. This is a draw cut saw and can be used to good advantage in cutting back branches in the tops of fruit trees. In cutting back, care should be taken to cut to a branch about the size of the one taken off. 12 inches long ..... .65

No. 9409.

9409. **PRUNING SAW,** Pacific Coast, crucible steel blade. **Every orchardist should have one or more of these swivel bladed saws.** Any cut that can be made with a key-hole saw in pruning work can be made with this saw and also many cuts where a mallet and chisel are ordinarily used. This saw enables the pruner to make all cuts close to and parallel with the remaining branch. This make of saw is used by nearly all of the leading orchardists throughout the country. A dull saw blade can instantly be changed for a sharp one, thus allowing the pruner to do good and fast work. The swivel blade can be turned at any angle so that it is possible to make with ease cuts which otherwise would be difficult to make. 14 inches long..... $ 1.50

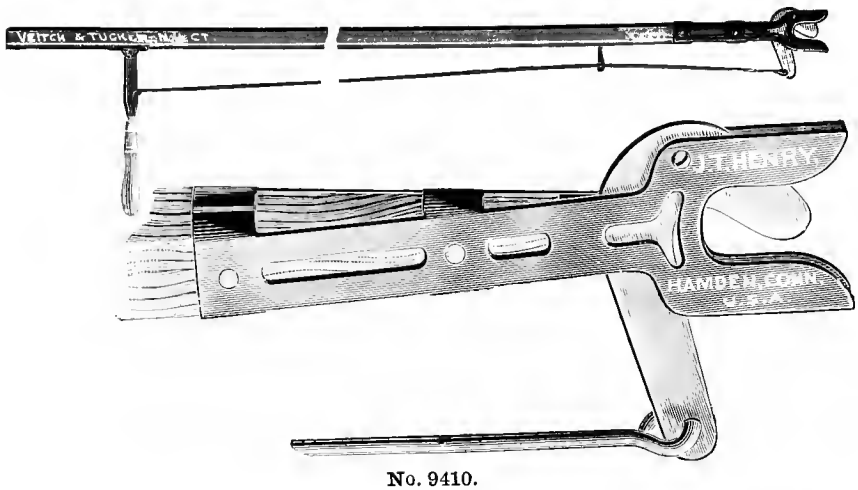
EXTRA BLADES for No. 9409 Pruning Saw, each..... .15

No. 9409A.

9409A. **PRUNING HOOK AND SAW** with knife and blade of crucible steel. Although possessing great strength, it is of light construction and can be used with or without a pole. The crescent shape blade has long, slender teeth so formed as to draw the saw into the wood. The saw blade is removable and is 10 inches long. This tool without the pole is well adapted for orchard pruning work and with the pole it can be used for training shade trees and cutting out blight in fruit trees during the summer. All dormant or summer orchard pruning work, with the exception of cutting out blight appearing on small branches, should be done near at hand in order to avoid stubs and the splitting down of branches, etc. Without pole..... 1.65

No. 9409B.

9409B. **PRUNING SAW AND KNIFE,** high grade steel chisel and saw blade, japanned frame. Saw cuts both ways, insuring smooth and rapid execution and preventing binding in cutting green wood. Length of saw 10 inches. This tool is well adapted for working in shade trees. Without pole..... 1.00

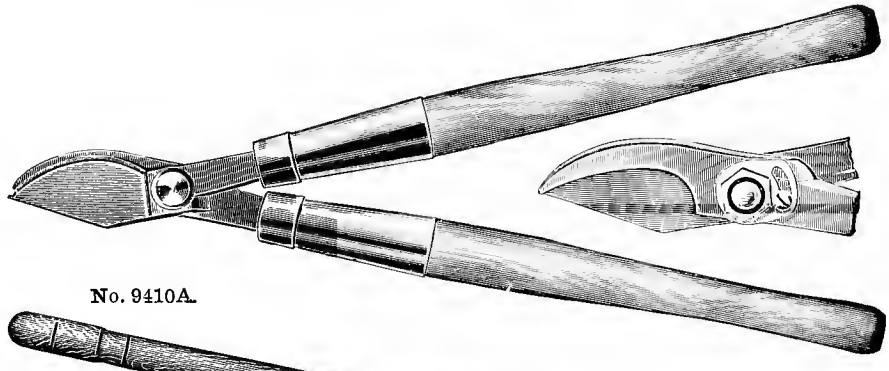


No. 9410.

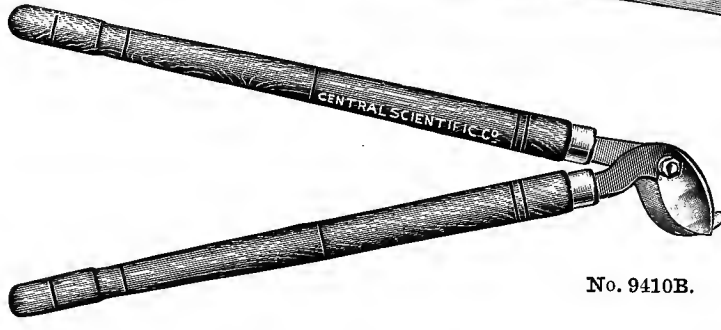
9410. **TREE PRUNER, Henry's.** The blade cuts from the top and from the moment the cut is started the weight of the branch opens the gap, preventing the knife from binding. This tool is designed for training shade trees and cutting out blight on small branches in fruit trees. Prices include pole.

Length, feet	6	10
Price	$ 1.00	1.25

EXTRA KNIFE for No. 9410. Will fit either length ..... $ 0.25



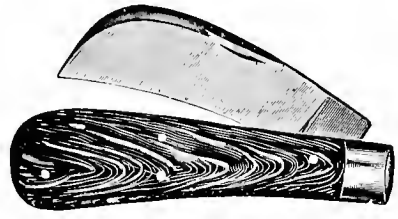
No. 9410A.



No. 9410B.

9410A. **PRUNING SHEAR, California Pattern,** long handle, blade forged from high grade steel. Many cuts which could be made with a saw can be made with these shears, thus saving time. **This is a tool which every orchardist should own,** as it will enable him to do quick and effective work. Length 26 inches 1.85

9410B. **LOPPING SHEAR,** blades of English steel, with 2½ in. cut. Length, 27 in..... 2.50



No. 9411.

9411. **PRUNING KNIFE,** one blade, good quality steel, iron lined, cocoa handle 4 inches long. This knife is especially good for training young trees and cutting off water sprouts.. $ 0.45

No. 9411A.

9411A. **PRUNING KNIFE,** finest quality glazed blade, cocoa handle 4½ inches long. A high grade knife for pruning off small branches and dressing up wounds..... 1.00

No. 9411B.

9411B. **PRUNING KNIFE,** finest quality glazed blade, beechwood handle, not folding. Well adapted for nursery pruning and training young trees. Total length 8 inches..... .45

No. 9412.

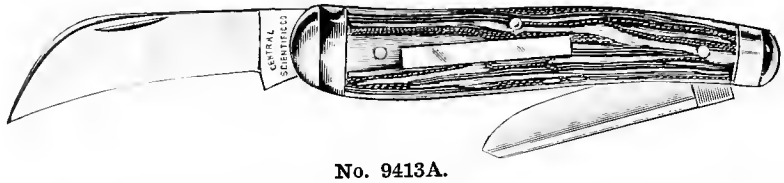
9412. **BUDDING KNIFE,** finest quality glazed blade, black horn handle, with folding ivory budder. This budding knife is well adapted for budding fruit trees or evergreen trees. Very high quality. Length of handle 3½ inches..... 1.10

No. 9412A.

9412A. **BUDDING KNIFE,** finest quality glazed blade, beechwood handle, not folding. Total length 5½ inches..... .22

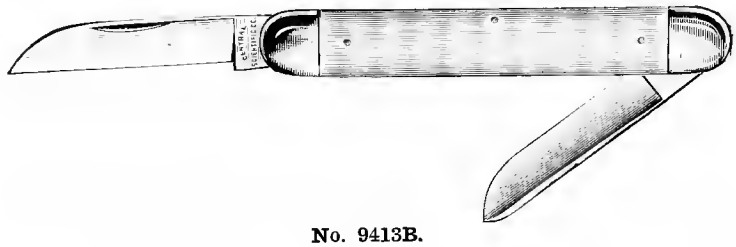
No. 9413.

9413. **PRUNING AND BUDDING KNIFE,** two blades, iron lined, stag handle. This knife is well adapted for both nurseryman and orchardist. 4 inches long..... $ 0.85



No. 9413A.

9413A. **PRUNING AND BUDDING KNIFE,** finest quality glazed blades, brass lining, German silver bolsters, stag handle 4 inches long. A high class knife for nursery and orchard work 1.10



No. 9413B.

9413B. **GRAFTING AND BUDDING KNIFE,** finest quality glazed blades, brass lining, German silver bolsters, ivory celluloid handle 4 inches long. Well adapted for a small fruit grower ..... 1.1(

No. 9413C.

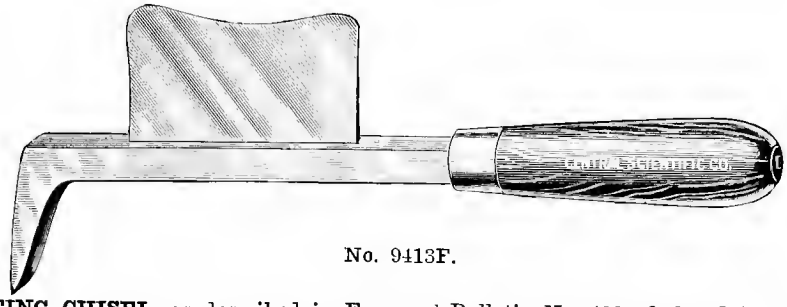
9413C. **PROPAGATING KNIFE,** finest quality glazed blade, brass lining, black handle 4 inches long. Well adapted for marking, cutting, and grafting work..... .6(

No. 9413D.

9413D. **GRAFTING KNIFE,** finest quality glazed blade, beechwood handle, not folding. A fine tool for either nursery grafting or top working of fruit trees. Total length 6¾ inches .2

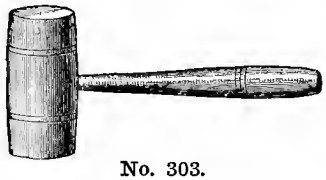
No. 9413E.

9413E. **GRAFTING KNIFE,** finest quality glazed blade, beechwood handle, not folding. Especially adapted for top working of fruit trees. Total length 8 inches..... .4



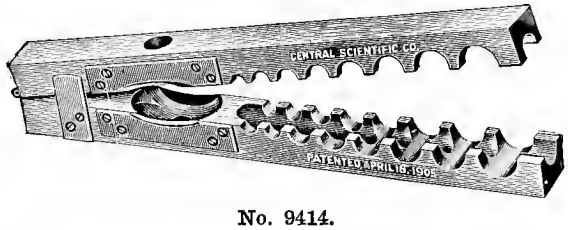
No. 9413F.

9413F. **GRAFTING CHISEL,** as described in Farmers' Bulletin No. 408 of the United States Department of Agriculture; with curved blade 3½ inches long, and chisel ½ inch wide. This grafting tool is well adapted for cleft grafting in top working of fruit trees. In use, the limb is first sawed off to from 1 to 1½ inches in diameter, split with the blade of the tool, spread with the wedge chisel, and the scions are then inserted. Total length 10 inches..... $ 1.10



No. 303.

303. **MALLET, Wood,** 3-inch face, for use with No. 9413F Grafting Chisel. A very handy tool to be used with the cleft grafting tool for top working of fruit trees..... .22



No. 9414.

9414. **BUDDING TOOL, White's.** A Scientific Instrument designed for the propagation of trees by the Annular, Semi-Annular, Patch and Veneer Methods.

This tool has been in continual use in the largest pecan nursery and grove in the country for some years, and has received many flattering recommendations from prominent horticulturists, nurserymen and others. Seedlings from ⅛ of an inch to a trunk or branch 3 inches or over in diameter can be budded with it. The tool may be dropped, but on account of the greater weight being at the hinge, it automatically closes in falling and the hinge strikes the ground first. Thus the blades are always protected. The tool may be laid on the ground without blades coming in contact with the soil. The tool can be hung over a limb while the bud is being wrapped. It can be safely and conveniently carried in the pocket. The holes in the handles between each pair of blades admit light to see that the bud is in the center of the annular cut.

The blades are made of the finest steel and are very durable. The graduated caliper holes are of standard gauges and can be used for calipering stock and budding wood where a close, complete, annular fit is desired.

Danger of spiral cutting is minimized with this tool. The resiliency of the handles makes the tool adapt itself to any stock without regard to tapering and without cutting into sapwood on the lower cut.....Net 2.75

GRAFTING SUPPLIES

9415. **GRAFTING WAX,** prepared according to formula by Prof. L. H. Bailey. Per pound. Net ..... .35

9417. **TAPE,** for binding wax to grafting wounds. Per roll of ten yards, ½ inch wide..... .11

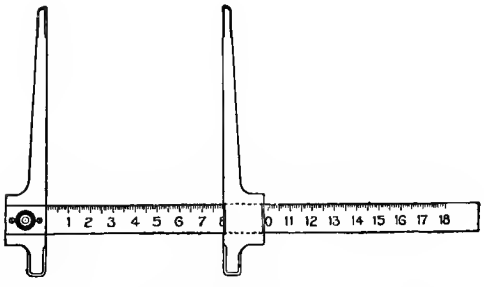
9419. **RAFFIA,** for grafting, long strand, first quality, natural color. Per ½ lb. hank..... .17
Per 5 lb. bundle..... 1.50

9420. **TWINE,** 8 ply cotton, for grafting. Per ½ lb. ball..... .22

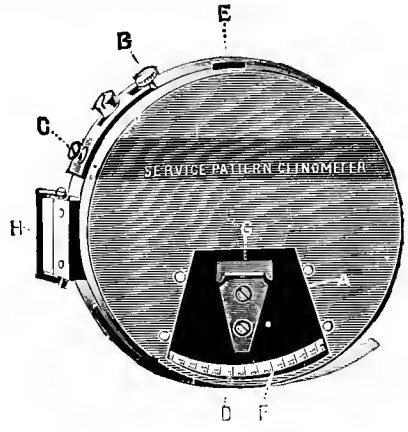
9421. **KNITTING COTTON.** No. 18. Per ball..... .09

For **CHART** on **GRAFTING,** see page 189.

FORESTERS' INSTRUMENTS



No. 9435.



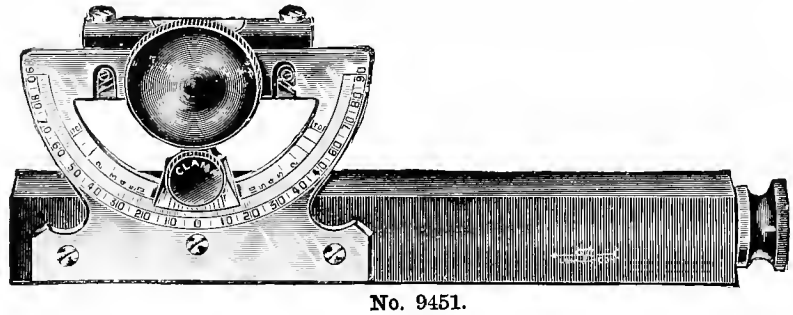
No. 9450.

9435. **TREE CALIPER,** 18 inch, of fine seasoned hardwood, best workmanship, both sides of beam graduated to 10ths inches and plainly numbered. The arms are removable for convenience in transportation. The stationary arm is held by brass clamp nut with lock nut. The eye of sliding arm is brass lined all around..... $ 4.00

9437. **TREE CALIPERS,** same as No. 9435, but with two clamp nuts.

Length, inches	24	30	50
Price	4.50	5.20	6.80

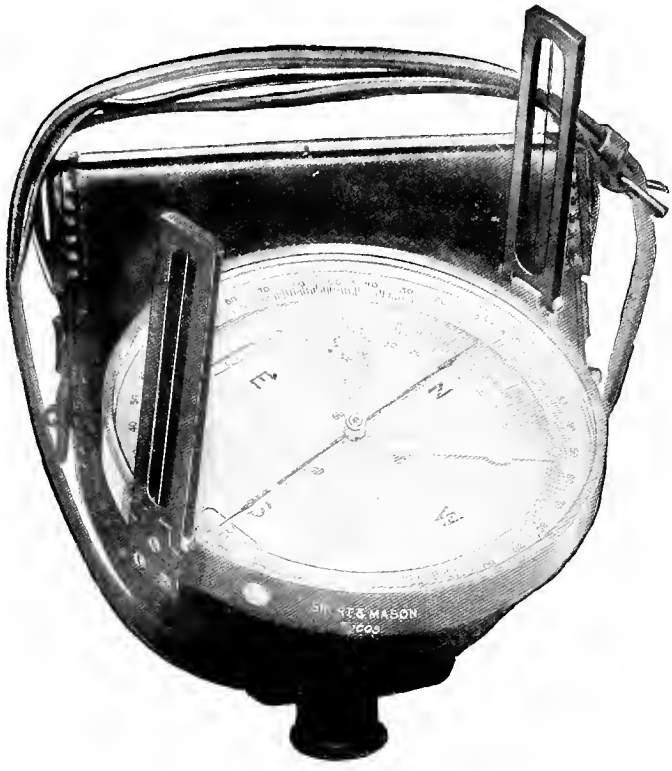
9450. **CLINOMETER, Service Pattern,** for measuring angles of elevation and depression. In use this instrument is held vertically in the left hand so that light passes through the window A and illuminates the scale. By looking through the side hole D and the small window E at the object to be observed, the graduations on the arc F will be seen reflected in the mirror G. If the knob B is then released, the scale will swing freely and the observed reading will show the number of degrees elevation or depression from 0 to 45 degrees, elevations being denoted by red figures and depressions by black. Complete as described in sling case.....Duty Free 12.50



No. 9451.

9451. **CLINOMETER, Abney's Reflecting Level or Pocket Altimeter.** A very useful and universal Clinometer. Used for getting the height of buildings, trees, hills, etc., and also for fixing the slopes for railroads, the rise and fall of ground for drainage purposes, and all operations where angular distance or inclination of surface is desired. Sighting tube 5 inches long, large German silver arc, extra long draw eye-piece, improved fixing clamp to vernier. The arc has two graduated scales upon it, one giving the angular measurements by degrees, and subdivided to 10 minutes by the vernier divisions on the index. The other scale is figured 1 to 10 with their subdivisions, representing 1/10, 1/5, 1/3, etc., of the length of the measured base, and is read off by the fiducial edge at the side of index. If, therefore, the edge coincides with division 4, the height of object would be one-fourth of the base line, etc. Complete in leather case, with directions.....Duty Free 11.00

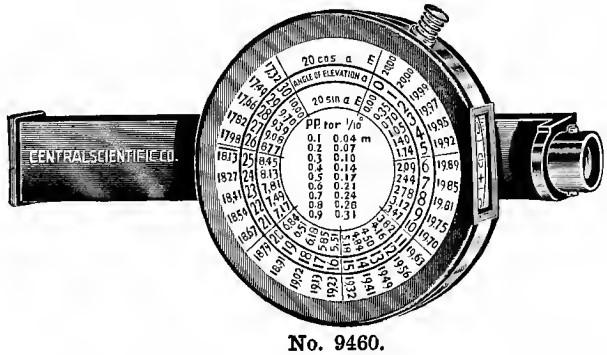
For **HYPSOMETER** see next page.



No. 9455.

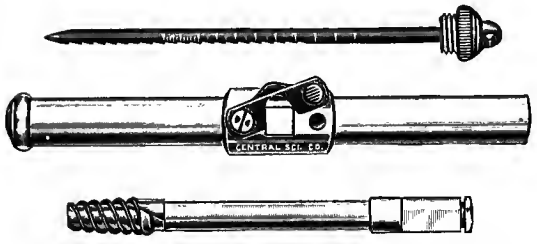
9454. **COMPASS, Surveying and Sight,** 3½ inch. An especially good instrument for approximate work, since it is of very substantial construction and will therefore bear the rough usage often happening in this kind of work. The exact magnetic variation can be obtained by revolving the inner circle (showing 30 degrees from zero either East or West) by means of its milled edge. A vernier is attached for closer reading. Complete with 3½ inch bar needle, jewelled center and stop, and ball and socket mounting (Jacob Staff), in a specially braced block sling leather case..... .....Duty Free $ 20.00

9455. **COMPASS, Surveying and Sight,** 5 inch. Same as No. 9454, but with 4½ inch bar needle .....Duty Free 22.50



No. 9460.

9460. **HYPSOMETER** for measuring heights of trees, buildings, etc. Consists of sight tube and balance circle Clinometer. Complete in a leather case with table and instructions for use.....Duty Free 10.50



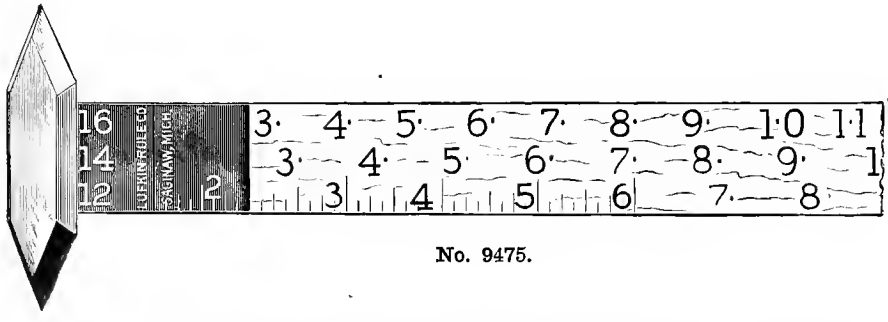
No. 9463.

No. 9470.

9463. **INCREMENT BORER** for determining the age or judging the rate of growth of standing timber; also for noting the depth of penetration of a wood preservative and its effect on cellular structure. By means of this borer, a smooth clean core may be removed from the wood so that the observations may be carefully made. For use in either hard or soft woods.

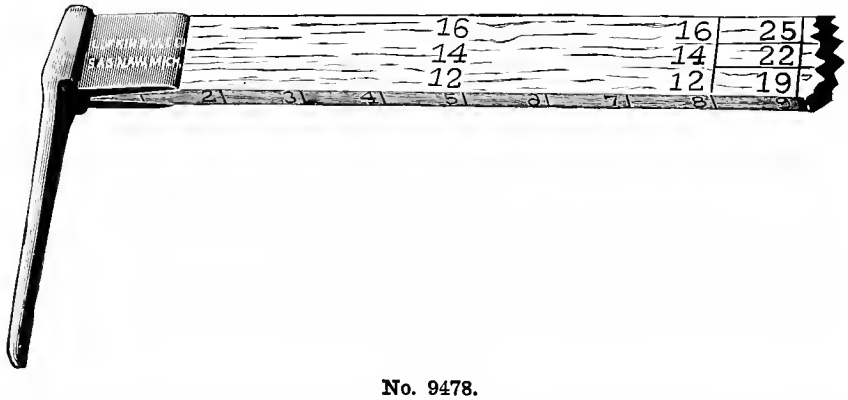
Length of bore, mm	60	150	250
Price, each	$4.80	9.60	18.50

9470. **TREE TAPE,** giving directly the diameter of tree when its circumference is measured. Metal lined hard leather case with nickel-plated trimmings, folding flush handle opened by pressing upon a pin on opposite side. The tape is of steel ⅜ inch in width and 50 feet long, graduated on one side in feet, tenths, and hundredths, and on the other side in diameters (inches and tenths of inches). Fitted with a special peg or spike for fastening to tree. (Not shown in illustration.)..... $ 6.00



No. 9475.

9475. **BOARD RULE,** three tier, extra heavy diamond head, figured 30 inches with 6 inch handle; full length 3 feet; for boards from 8 to 18 feet long..... 1.50

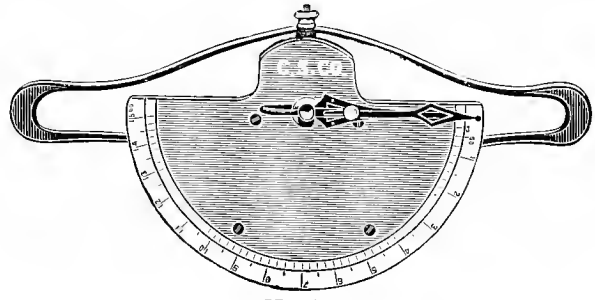


No. 9478.

9478. **LOG RULE, Doyle Scale,** solid hook, figured 48 inches with 8 inch handle; full length 4 feet 8 inches; for logs from 12 to 24 feet long..... 1.65

9479. **LOG RULE, Scribner Scale,** otherwise same as No. 9478..... 1.65

ANIMAL HUSBANDRY



No. 9501.

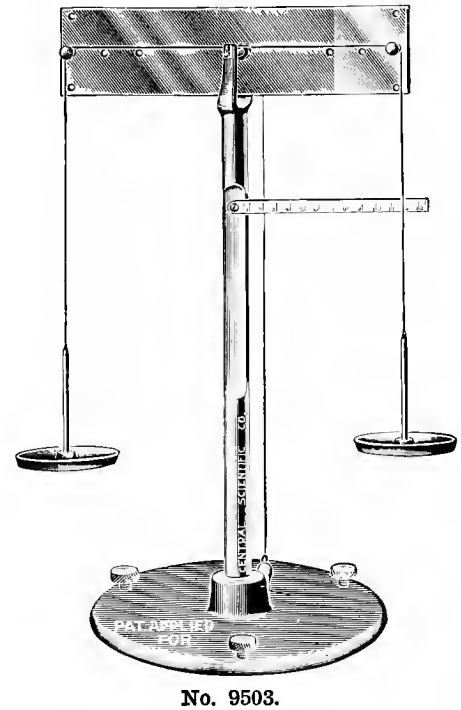
9500. **IOWA RECORDING AND INTEGRATING TRACTION DYNAMOMETER.** Designed by Prof. J. B. Davidson, Chief of Agricultural Engineering, Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa.

Send for Special Circular.

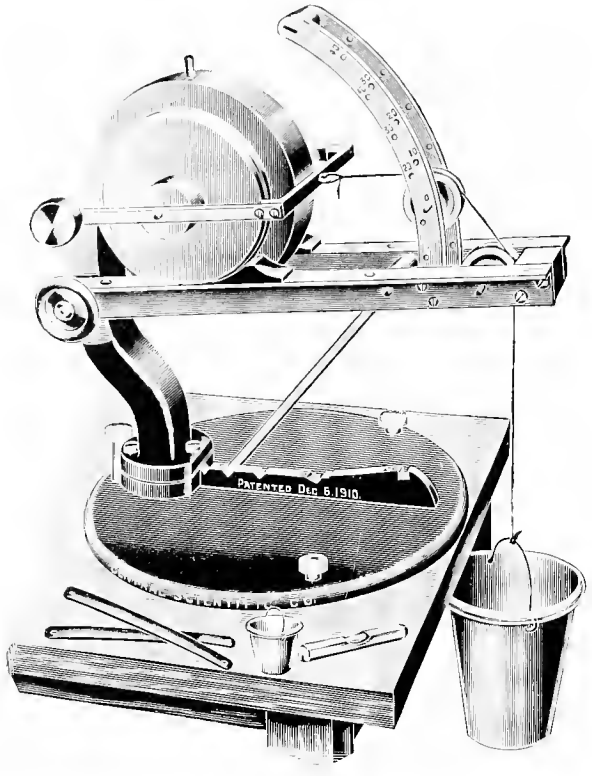
9501. **DYNAMOMETERS.** Used for ascertaining the draft of plows, mowing machines, wagons, etc. Can be attached to a tackle or a derrick for hoisting hay, feed, etc., the weight of which can at once be read on dial. Will also show what weight a horse can pull by securing one end and hitching an animal to the other. Each dynamometer is supplied with a loose pointer to remain at maximum strain.

Range, lbs.	500	2,000	3,500	5,000	10,000
Smallest graduation, lbs.	5	25	50	50	100
Price	$36.00	36.00	42.00	48.00	80.00

9503. **DOUBLE-TREE APPARATUS,** for determining the correct position of the single-trees, so that the double-tree may be an evener. This apparatus is essentially a lever of the first class. It consists of a cast iron base smoothly finished and painted, to which is attached an upright standard. At the top of this standard is a brass fork, in the prongs of which are cut V's in which rest the axis passed through the central point of the polished brass beam which represents the double-tree. Pins, which represent attachments of single-trees to the double-tree are provided to fit into holes drilled in the brass beam, two of which holes are equidistant from the central point and in the same straight line with it. A string resting on these pins is connected at its extremities with two brass scale pans of equal weight. The scale pans represent the draft and the strings the line of draft. A metal scale, one end of which is fastened at its zero point to the upright in a line directly beneath the central point, serves as a measure in determining the distance of the lines of draft from this central point. The base is provided with screws and the apparatus is furnished with plumb bob for leveling. Complete as illustrated..... $ 15.00



No. 9503.



No. 9504.

9504. **GRADE-DRAFT APPARATUS.** This ingenious device designed by Prof. Gibbs demonstrates clearly and easily the factors governing grade-draft. With each instrument is sent a pamphlet as a guide in the quantitative study of the following problems:

1. Effect of Size of Wheels on Draft.
2. Effect of Wide and Narrow Tires on Draft.
3. Sliding and Rolling Friction.
4. Effect of Size of Axle on Draft.
5. Effect of Road Grade on Draft.
6. Effect of Road Obstruction on Draft.
7. Effect of Angle of Hitch on Draft.

The apparatus consists of a substantial metal base provided with three leveling screws, to which is attached a casting to support the metal track. The device illustrated resting on the track is built up in sections in such a way that discs 4.5 and 1.5 inches in diameter may rest on the track at will. These discs represent large and small wheels and are used in the study of Effect of Size of Wheels on Draft.

The 4.5 inch disc is further divisible into two sections ¾ and ¼ inch thick representing ¾ and ¼ inch tires in the study of Effect of Wide and Narrow Tires on Draft.

The line of draft in all experiments is represented by the string attached to the carriage. This string is run over a pulley adjustable in the segment to vary the Angle of Hitch. It then passes over a second pulley to a pail to which it is attached. This pail with the different quantities of bird shot which may be added represents the draft.

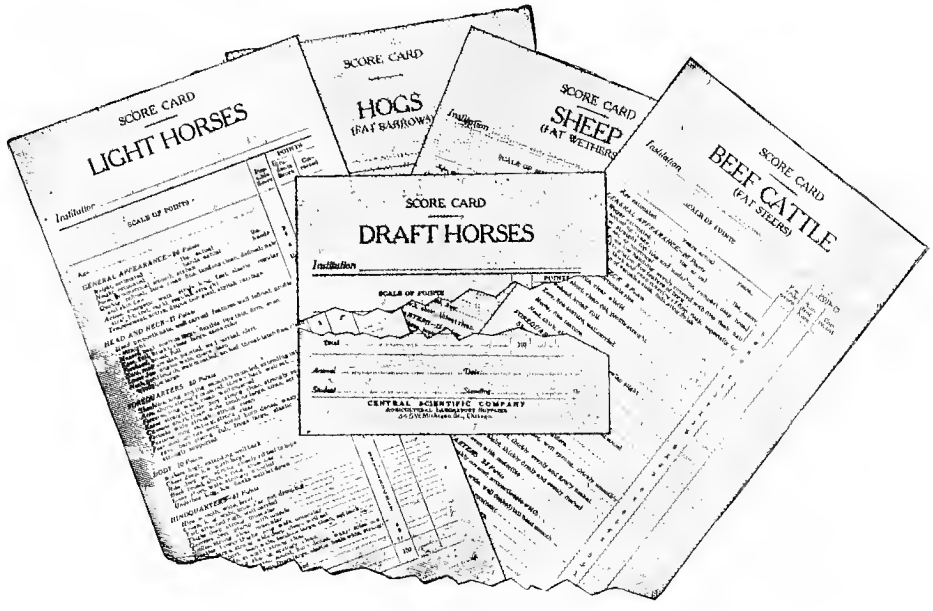
In the study of draft relative to hard and soft roads, leather strips, which represent the soft road, are provided, which may be attached to the steel track. A road obstruction is represented by two metal pieces (shown in front of wheels) which may be placed on the track giving an obstruction 0.05 inch high.

This instrument is accurately made in every detail and quantitative results may easily be obtained with a high percentage of precision. Its utility in demonstrating in the laboratory factors dealing with problems of draft will recommend it to both Physicists and Agriculturists.

Complete with large and small pail and full experimental directions..... $ 45.00

1608. **LEAD SHOT**, for use with No. 9504 Grade Draft Apparatus, per lb..... .16

For **CHART** on **THE PLOW**, see page 189.



Nos. 9505-9513.

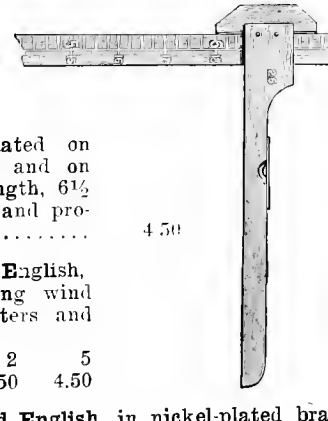
SCORE CARDS

In the judging of animals our score cards will be found indispensable when once tried. They save time and in addition are instructive in that they direct the student's attention to qualities and defects which might otherwise be overlooked. The low price should put an equipment in every school. Each subject is put up in tablets of 50 sheets.

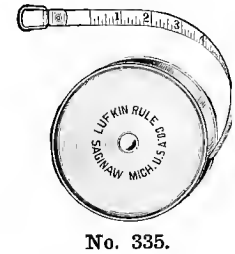
9505. **SCORE CARDS, Light Horses.** Per tablet of 50 sheets..... $ 0.20
9507. **SCORE CARDS, Draft Horses.** Per tablet of 50 sheets..... .20
9509. **SCORE CARDS, Beef Cattle.** Per tablet of 50 sheets ..... .20
9723. **SCORE CARDS, Dairy Cattle.** Per tablet of 50 sheets..... .20
9511. **SCORE CARDS, Sheep.** Per tablet of 50 sheets ..... .20
9513. **SCORE CARDS, Hogs.** Per tablet of 50 sheets ..... .20

MEASURING INSTRUMENTS

No. 9515.



9515. **MEASURING STANDARD,** graduated on one edge in hands and quarters, and on the other in feet and inches. Length, 6½ feet. Sliding arm held by spring and provided with level..... 4.50



No. 335.

335. **STEEL POCKET TAPE, Metric and English,** in German silver case with spring wind and stop. Graduated in millimeters and 16ths of inches.

Length, meters	1	2	5
Price	1.00	1.50	4.50

336. **LINEN POCKET TAPE, Metric and English,** in nickel-plated brass case with spring wind and center stop. Graduated in millimeters and 16ths of inches.

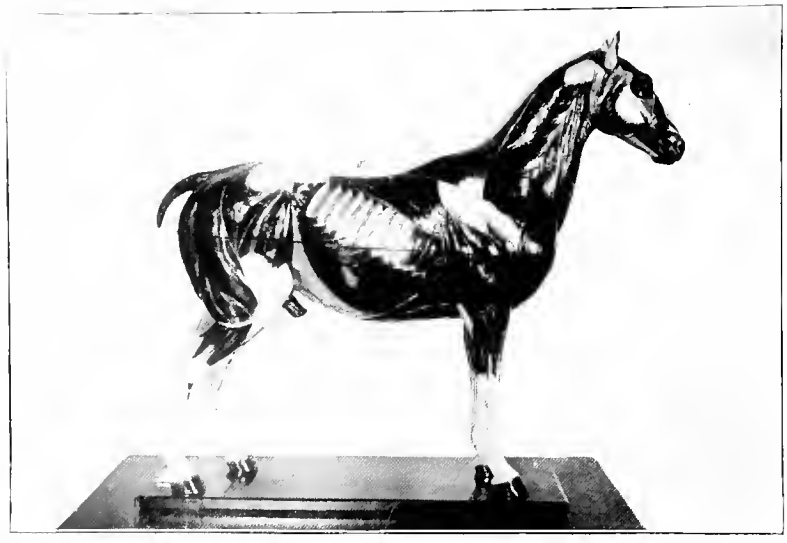
Length, meters	1	2
Price	.50	.75

337A. **LINEN POCKET TAPES, English,** extra grade, waterproof coated, in patent leather case, with brass folding handle and trimmings; 40 feet, $0.85; 100 feet..... 1.50

For other **TAPE** see page 107.

9516-9. **ANIMAL CALIPERS** and **MEASURING CHAINS,** see page 188.

VETERINARY MODELS AND CHARTS



No. 9521.

9521. **MODEL OF HORSE,** 60 cm. to 70 cm. high, showing clearly the muscles on both sides. The left side with one foreleg is removable exposing the interior organs in their exact location. Many of these are removable so as to expose to view the most important blood vessels, etc. A very exact model of the highest pedagogical value..Duty Free $ 180.00

9523. **MODEL OF HORSE,** one-fifth natural size, entirely dissectible.....Duty Free 75.00

9527. **HEART OF HORSE,** natural size, dissectible.....Duty Free 13.20

9529. **INTESTINAL CANAL OF HORSE**.....Duty Free 12.00

9531. **KIDNEY OF HORSE**.....Duty Free 8.40

9533. **BRAIN OF HORSE,** divisible into two parts.....Duty Free 4.00

9534. **BRAIN OF HORSE,** divisible into four parts.....Duty Free 8.00

9535. **GENITALS OF STALLION,** natural size, longitudinal cross-section.....Duty Free 14.40

9537. **GENITALS OF MARE,** natural size.....Duty Free 14.40

No. 9549.

9539. **TEETH OF HORSE, Lower Jaw,** showing ten stages of development.....Duty Free 8.00

9541. **TEETH OF HORSE, Upper and Lower Jaw,** showing the following ages: 6 months, 1, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 18 and 26 years.....Duty Free 36.00

9543. **HEAD OF HORSE,** natural size, mounted on a stand; showing on one side a median cross-section and on the other the muscles, blood vessels and nerves..Duty Free 36.00

9545. **EYE OF HORSE,** five times enlarged, mounted on a stand; dissectible.....Duty Free 10.80

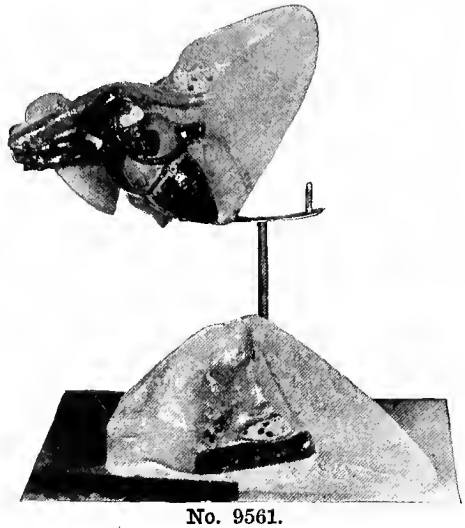
9546. **EYE OF HORSE.** Vertical cross-section, many times enlarged; shows clearly the location of the coats of the eyeball, the vitreous humor, the crystalline lens with its suspensory ligament, the ciliary muscles, the iris, the pupil, the entrance of the optic nerve through the coats, etc.....Duty Free 12.00

9547. **EAR OF HORSE,** five times enlarged, dissectible. .....Duty Free 44.00

9549. **HOOFS OF HORSE,** collection of 37 models showing healthy and diseased hoofs. Entire collection. .....Duty Free 60.00

9550. **HOOF OF HORSE, Fore,** divisible into three parts. With shoe.....Duty Free 6.40

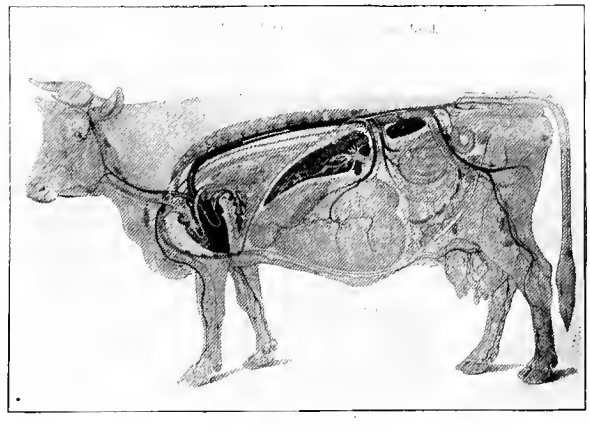
9550A. **HOOF OF HORSE, Hind,** without shoe and not divisible. .....Duty Free 2.80



No. 9561.

9551.	**MODEL OF COW.** One-third natural size. Shows on one side the muscles and principal blood vessels; the digestive organs are removable and dissectible	Duty Free	$ 96.00
9553.	**MODEL OF COW,** one-fifth natural size, entirely dissectible	Duty Free	75.00
9555.	**UDDER OF COW**	Duty Free	7.20
9557.	**STOMACH OF SHEEP,** dissectible	Duty Free	12.00
9559.	**INTESTINAL CANAL OF AN OX**	Duty Free	9.60
9560.	**STOMACH OF OX.** One-half natural size. Completely dissectible	Duty Free	24.00
9561.	**LUNG OF A RUMINANT**	Duty Free	12.00
9563.	**FOOT OF OX.** Natural size, divisible into four parts	Duty Free	10.00
9565.	**FOETUS OF OX,** in utero, early stages	Duty Free	10.40
9567.	**HEAD OF OX.** Natural size, mounted on a board to show cross-section through the frontal sinus, brains, nose, throat and larynx	Duty Free	16.00
9569.	**KIDNEY OF OX,** natural size, dissectible	Duty Free	8.40
9571.	**FOETUS OF A SHEEP,** in utero, natural size	Duty Free	9.60
9572.	**FOETUS OF SWINE,** in utero, natural size	Duty Free	17.60
9573.	**BRAIN OF OX,** four pieces	Duty Free	8.00
9575.	**LARYNX OF A SHEEP,** showing muscles; divisible into two parts	Duty Free	4.80

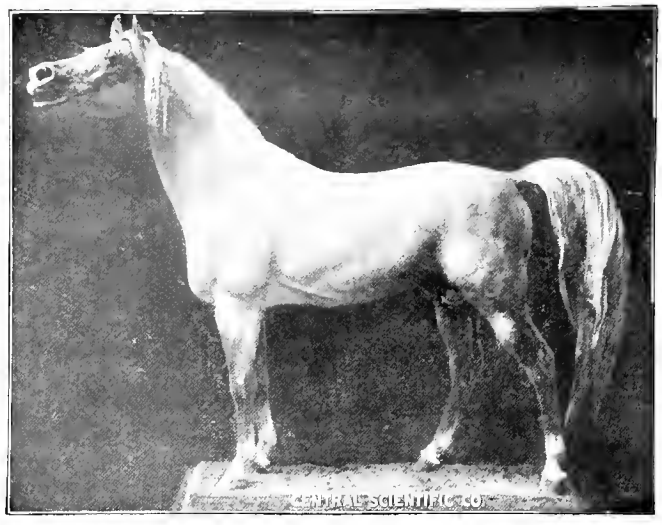
CHARTS



No. 9578.

9578.	**VETERINARY ANATOMICAL CHARTS,** set of six showing Horse, Mare, Cow, Bull, Pig and Dog. Mounted on linen with rollers	Duty Free	12.50
9581.	**CIRCULATORY SYSTEM OF A RUMINANT,** excellent execution in color. Consists of two charts. Mounted on linen, with rollers	Duty Free	7.50

For other **CHARTS,** see page 189.



No. 9585.

MODELS OF THOROUGHBRED ANIMALS

These models are from some of the most noted European thoroughbreds. They are made of plaster of paris and are carefully painted in characteristic colors. All models are well reinforced with wire and are one-sixth life size in the case of the horses and oxen, and one-fourth life size in the case of the hogs and sheep.

9585. **MODELS OF HORSES,** made at Royal Saxon Stud at Moritzburg. Each..Duty Free $ 15.00

A. **"Ehrenhafte,"** Oldenburg Stallion, 2 years old.
B. **"Clairon,"** Belgian Stallion, 4 years old.
C. **"Mylon,"** East Frisian Stallion, 3 years old.

9587. **MODELS OF OXEN,** made at the Royal Veterinary High School at Dresden. Each.....Duty Free 15.00

A. **Simmenthaler Bull.**
B. **Simmenthaler Cow.**
C. **Shorthorn Cow.**
D. **Pinzgauer Cow.**
E. **English Cow.**
F. **French Cow.**
G. **Swiss Cow.**
H. **Black Speckled East Frisian.**
J. **Red Speckled East Frisian.**
K. **East Frisian Bull.**
L. **European Bison,** model made from life in the Zoological Gardens at Dresden, 1913.

9589. **MODELS OF HOGS,** large, white thoroughbreds. Each .....Duty Free 12.00

A. **"Derby IV," Breeding Boar.**
B. **No. 713, Breeding Sow.**

9590. **MODELS OF SHEEP.** Each.....Duty Free 11.75

A. **East Frisian Ewe,** modeled at the Royal Veterinary High School at Dresden.
B. **East Frisian Ram,** modeled at the Royal Veterinary High School at Dresden.
C. **Moorland Sheep,** modeled at the Dresden Zoological Garden.

CATTLE AND POULTRY INSTRUMENTS

No. 9591.

9591. **CATTLE INSTRUMENT CASE.** Polished oak case containing the following instruments and supplies: Milk Fever Outfit, Dose Syringe, Trocar for Bloat, 3 Lead Probes, 2 Milk Tubes, Teat Dilator, Teat Slitter (or Bistoury), Teat Opener, Fever Thermometer, Cake of Animal Soap, and two Bandages. Value if purchased separately, $15.00. Our price, with full directions .....Net $ 10.00

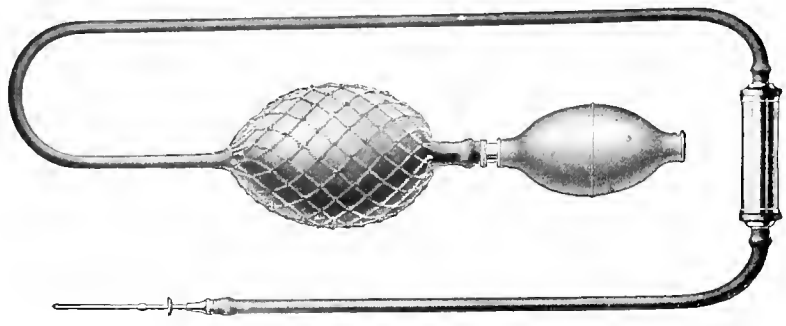
No. 9592.

9592. **CATTLE INSTRUMENT CASE.** Large polished oak case containing the same instruments and supplies as No. 9591, and in addition a complete Garget Outfit, and a Sinus (or General Syringe). Value if purchased separately, $21.00. Our price, with full directions.....Net 15.00

No. 9597.

9597. **TUBERCULIN TESTING OUTFIT, Boston,** consisting of syringe, three needles, trocar, thermometer and 40 c. c. of Tuberculin, which is sufficient for ten tests..Net 5.00

9597A. **TUBERCULIN, H. K. Mulford's, 40 c. c.; sufficient for ten tests**.....Net 1.25

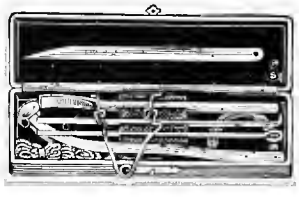


No. 9598.

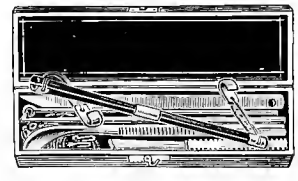
9598. **MILK FEVER APPARATUS,** Boston, fitted with improved non-return flow valve milking tube. The apparatus provides for the injection of sterilized atmospheric air through each teat until the udder is distended .....Net $ 3.50

No. 9598A.

9598A. **VETERINARY THERMOMETER,** first grade, pear-shaped bulb, ring top, with magnifying tube, in hard rubber case, with certificate .....Net 1.25



No. 9599.



No. 9599A.

9599. **CAPONIZING SET.** Includes Cords, Knife, Spring Spreader, Hook, Probe, Caponizing Cannla and Curved Spoon Forceps. Complete with instructions in a velvet lined case..Net 2.75

9599A. **CAPONIZING SET.** Similar to No. 9599, but with a Special Testicle Remover in place of the Caponizing Canula, and an improved Spreader. Complete with directions in an oak case.....Net 4.00

9599C. **KILLING KNIFE.** (See page 189.).....Net .50

129A. **POULTRY CALIPER.** (See page 189.) 4.45

9599H. **SCORE CARD, Eggs.** Especially valuable in judging eggs, since the student's attention is directed to qualities and defects, which might otherwise be overlooked. Per tablet of 50 sheets..... .20

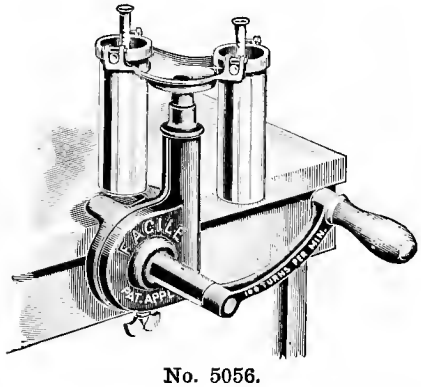
For **CHART** on **THE CHICKEN,** see page 189.

DAIRY HUSBANDRY

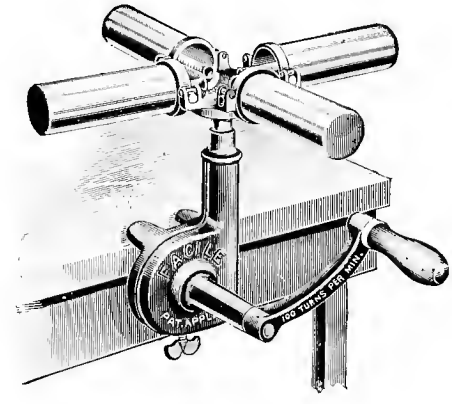
BABCOCK MILK TESTERS

The milk testers here listed are all of the well known "Facile" and "Facile" Jr. types, which are undoubtedly the best on the market. They are unhesitatingly guaranteed to give complete satisfaction.

HAND-POWER MACHINES



No. 5056.



No. 5057.

5056. **BABCOCK MILK TESTER,** two bottle size. This is the original design for the spiral, gear-driven open Babcock Machine. The machine itself consists of but two castings, forming the gear case. These are united at a ground joint, so that the gear case is oil tight, this construction being exclusive to the "Facile." The machines are sent out packed with a high grade semi-fluid lubricant which keeps the entire machine lubricated for a long time.

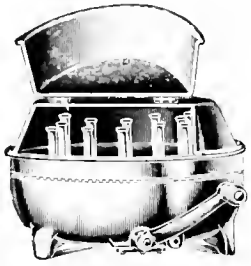
There is only one large gear and the vertical spindle which has spiral teeth milled directly into it. Both of these are made of steel, and as they run in grease, they are absolutely noiseless and run with a smoothness that can not be approached by any other type of gearing. The bottle carrier, which is removably attached to the top of the spindle, is a heavily tinned malleable casting. The rotating pockets are of seamless brass, of heavy gauge, swaged over and soldered to heavy malleable trunnions. These are secured in place in the bottle carrier by rivets, so that there is no chance for any of the parts to fly off while in motion. These machines are absolutely safe, something that should be considered in buying an open Babcock Tester. The seamless pockets, which swing to a perfectly horizontal position when at speed, are of the proper depth to contain hot water to submerge the bottles and keep the fat in the neck in a melted condition so that an accurate test can be made.

The machine can be attached to any table, or bench, by means of the thumb screw. It does not require any separate clamp, or any bolts or screws. Complete with two 6 inch, 18 gram, 10 per cent Milk Test Bottles; one 17.6 c.c. Pipette; one 17.5 c.c. Acid Measure; one Test Bottle Brush and full directions for use. (For Acid see page 87.) .....Net $ 4.00

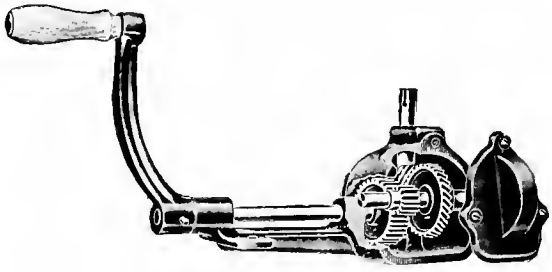
5056A. **BABCOCK MILK AND CREAM TESTER.** Same as No. 5056, but with two 6 inch, 18 gram, 10 per cent Milk Test Bottles; two 6 inch, 18 gram, 30 per cent Cream Test Bottles; one combined 17.6-18 c.c. Pipette; one 17.5 c.c. Acid Measure; one Test Bottle Brush, and full directions for use. (For Acid see page 87.).....Net 4.50

5057. BABCOCK MILK AND CREAM TESTER. Same as No. 5056A, but four bottle size. Complete with four 6 inch, 18 gram, 10 per cent Milk Test Bottles; two 6 inch, 18 gram, 30 per cent Cream Test Bottles; one combined 17.6-18 c.c. Pipette; one 17.5 c.c. Acid Measure; one Test Bottle Brush, and full directions for use. (For Acid see page 87.).....Net 5.50

9607-9607V. **REPAIR PARTS** for above Babcock Testers, see page 187.



No. 5058.



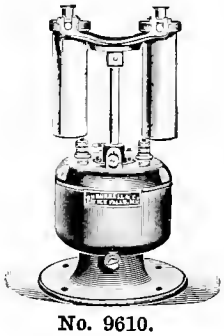
Showing Gear Case of No. 5058.

5058. **BABCOCK MILK TESTER,** improved iron frame for hand power. Compact and serviceable. Solid iron case, with hinged cover. The gearing consists of a pair of worm or spiral gears, and a pair of spur gears. All the gearing and shafts are mounted on a separate frame, which is detachably secured to the under side of the body or case. This is a patented feature of the "Facile." A new feature in the construction of this gear frame, or yoke, is that it is made to entirely enclose the gears, being fitted with a detachable cover, having a ground joint, and the gears being packed in lubricating grease. This makes the gears run smoothly and noiselessly, and keeps them lubricated indefinitely, protecting them from wet and consequent rust. The separate illustration of the gear frame clearly shows not only the compact nature of the gearing, but also the oil-tight gear case.

The bottle carriers are solid malleable castings, heavily tinned. The swinging pockets are of seamless brass with tinned malleable hangers. The bottles are perfectly horizontal when rotating. Prices include one set of six-inch, 18 gram, 10 per cent Milk Test Bottles, one 17.6 c.c. Pipette, one 17.5 c.c. Acid Measure, one Test Bottle Brush and full directions. (For Acid see page 87.)

Order Letter	A	B	C	D
Number of Bottles	6	8	10	12
Price, each....Net	$9.00	10.00	12.00	14.00

9609. **BABCOCK CREAM TESTER,** twelve bottle size. Same as No. 5058 Milk Tester, but for 9-inch cream bottles. Complete with twelve 9-inch, 18 gram, 30 per cent Cream Test Bottles, one 18 c.c. Pipette, one 17.5 c.c. Acid Measure, one Test Bottle Brush, and full directions....Net $ 28.00



No. 9610.

No. 9611.

ELECTRIC MOTOR DRIVEN MACHINES

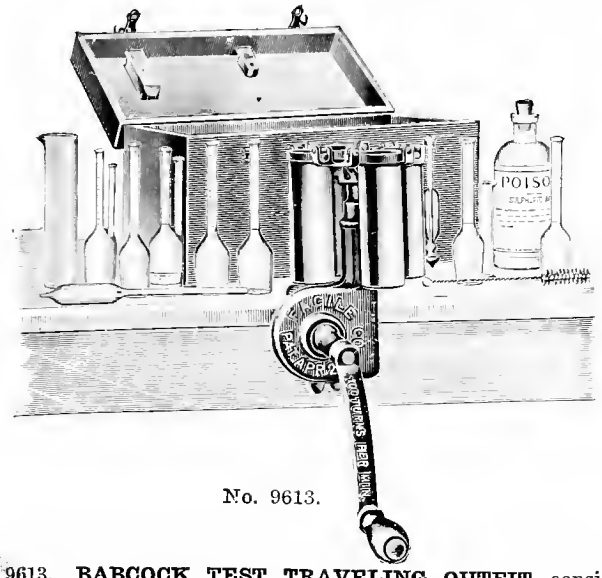
9610. **BABCOCK MILK TESTERS.** Same style as Nos. 5056-7, but mounted directly on a vertical spindle electric motor. Prices include same glassware and accessories as Nos. 5056-7. (For Acid see page 87.)

Order Letter	A	B	C	D
Number of Bottles	2	2	4	4
Voltage	110 D.C.	110 A.C.	110 D.C.	110 A.C.
Price, each....Net	35.00	35.00	36.00	36.00

9611. **BABCOCK MILK TESTERS.** Same frame and bottle carrier as No. 5058. The motor is carried on a separate frame or sub-base, and is provided with a starting device. Prices include same glassware and accessories as No. 5058. (For Acid see page 87.)

Order Letter	A	B	C
Number of Bottles	6	8	12
Price, each, for 110 volts, D. C....Net	51.00	52.00	56.00
Order Letter	D	E	F
Number of Bottles	6	8	12
Price, each, for 110 volts, A. C....Net	51.00	52.00	56.00

TRAVELING OUTFITS



No. 9613.

No. 9616.

9613. **BABCOCK TEST TRAVELING OUTFIT,** consisting of two bottle Babcock Tester of No. 5056 and following accessories:

2 Six-inch, 18 g., 10% Milk Test Bottles.
2 Six-inch, 18 g., 30% Cream Test Bottles.
2 Double Neck Skim Milk Bottles.
1 Cream and Milk Pipette (17.6-18 c.c.).
1 Test Bottle Brush.
1 Floating Dairy Thermometer.
1 Hydrometer Jar, 10 x 1½ inches.
1 17.5 c.c. Acid Measure.
1 Small Quevenne's Lactometer.
1 Set Directions.

In handsomely finished hardwood case with separate compartments for glassware and acid. (For Acid see below).....Net $ 9.00

9615. **BABCOCK TEST TRAVELING OUTFIT,** same as No. 9613, but with four bottle Babcock Tester of No. 5057, and two extra Milk Test Bottles.....Net 10.00

9616. **BABCOCK TEST TRAVELING OUTFIT,** consisting of No. 5057 Babcock Tester in a handsome leather case as shown in the illustration. The case is 10½ x 10½ x 10½ inches outside, and contains the same equipment of glassware and accessories as listed under No. 9615 above. Complete.....Net 25.00

For **REPAIR PARTS** for Testers of above Outfits, see page 187.

ACID FOR MILK AND CREAM TESTERS

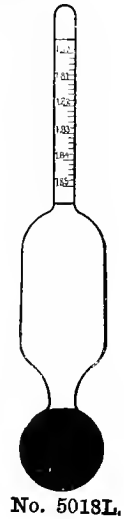
Since acids must now be shipped in separate boxes, we are no longer listing the necessary sulphuric acid with each Babcock Milk Tester. When the acid is desired, it should be selected from the following list:

5059. **SULPHURIC ACID,** for use with Babcock Milk Testers, in bottles or carboys as below:

Order Letter.....	A	B	C	D	E
Weight, pounds.....	1	2	4	9	200 (Approx.)
Per bottle.....Net	$0.25	.30	.50	.70	...
Per carboy.....Net	.....	...	...	...	4.00

Carboys are charged for at $2.00 each in addition to the above price and will be credited at the price paid if received by us in good condition with the return charges paid.

The above acid is of proper strength to give correct results with the Babcock Test. If the acid is too strong, the fat is charred; if too weak, the casein is not wholly dissolved. The strength is indicated by the specific gravity which should be tested by No. 5018L Acidometer.



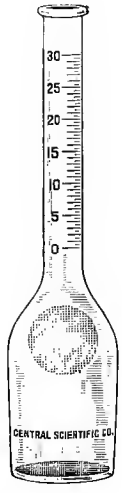
No. 5018L.

5018L. **ACIDOMETER,** for testing the specific gravity of sulphuric acid to be used in connection with the Babcock Test. The acid should have a specific gravity between 1.82 and 1.83 at a temperature of 60 degrees, and by allowing this instrument to float in the acid and reading off the graduations at the level of the acid the strength can be told at a glance ..... .75

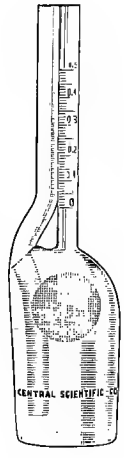
9618-9. **BABCOCK MILK TESTERS, International,** see page 190.

TEST BOTTLES

No. 5060A.



No. 5060B.



No. 5060F.

No. 9643.

		Per doz.
9620.	**MILK TEST BOTTLE,** 6 inch, 18 gram, 8 per cent. Graduated to 1/10 per cent.....	$ 1.65
5060A.	**MILK TEST BOTTLE,** 6 inch, 18 gram, 10 per cent. Graduated to 2/10 per cent.....	1.60
5060B.	**CREAM TEST BOTTLE,** 6 inch, 18 gram, 30 per cent. Graduated to ½ per cent.....	2.00
5060C.	**CREAM TEST BOTTLE,** 6 inch, 18 gram, 40 per cent. Graduated to 1 per cent.....	2.20
5060D.	**CREAM TEST BOTTLE,** 6 inch, 18 gram, 50 per cent. Graduated to 1 per cent.....	2.20
5060E.	**CREAM TEST BOTTLE,** 6 in., 9 gram, 50 per cent. Graduated to ½%. Direct reading	2.60
5060F.	**SKIM MILK BOTTLE,** "Perfect," 6 inch. Graduated to 1/100 per cent.....	7.20
5060G.	**CREAM TEST BOTTLE,** 9 inch, 18 gram, 30 per cent. Graduated to 2/10 per cent....	3.00
5060H.	**CREAM TEST BOTTLE,** 9 inch, 18 gram, 50 per cent. Graduated to ½ per cent.....	3.00
5060J.	**CREAM TEST BOTTLE,** 9 inch, 18 gram, 55 per cent. Graduated to ½ per cent.....	3.00
5060K.	**CREAM TEST BOTTLE,** 9 inch, 18 gram, 100 per cent. Graduated to 1 per cent.....	4.00

NOTE.—Nine-inch Cream Test Bottles are too long for regular Babcock Testers. See No. 9609 Cream Tester, page 86.

STANDARD MILK AND CREAM TEST BOTTLES

The following bottles (Nos. 9632-9634) are made in accordance with the specifications formulated by the Bureau of Standards, Washington, D. C., and adopted by the Official Dairy Instructors' Association, and by the State of Indiana.

		Per doz.
9632.	**MILK TEST BOTTLE, Standard,** 6 in., 18 g., 8 per cent. Graduated to 1/10 per cent..	2.75
9633.	**CREAM TEST BOTTLE, Standard,** 6 in., 9 g., 50 per cent. Graduated to ½ per cent...	3.35
9634.	**CREAM TEST BOTTLE, Standard,** 9 in., 9 g., 50 per cent. Graduated to ½ per cent...	3.35

The following bottles (Nos. 9636-9641) are made in accordance with the specifications formulated by the Dairy and Food Commission, Madison, Wis.

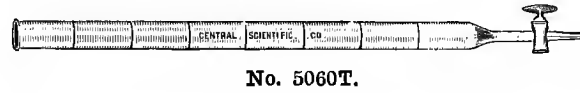
9636.	**MILK TEST BOTTLE, Standard,** 6 in., 18 g., 10 per cent. Graduated to 2/10 per cent.	2.00
9637.	**CREAM TEST BOTTLE, Standard,** 6 in., 18 g., 30 per cent. Graduated to ½ per cent.	2.25
9638.	**CREAM TEST BOTTLE, Standard,** 6 in., 18 g., 40 per cent. Graduated to ½ per cent.	2.50
9639.	**CREAM TEST BOTTLE, Standard,** 7½ in., 18 g., 50 per cent. Graduated to ½ per cent.	2.75
9640.	**CREAM TEST BOTTLE, Standard,** 9 in., 18 g., 30 per cent. Graduated to 2/10 per cent.	3.35
9641.	**CREAM TEST BOTTLE, Standard,** 9 in., 18 g., 50 per cent. Graduated to ½ per cent.	3.35
9643.	**BUTTER TEST BOTTLE, Illinois,** designed by N. W. Hepburn of the University of Illinois. This is a 9-inch bottle for testing 9-gram samples of butter. The neck is graduated for reading up to 90 per cent and the results obtained compare very favorably with those obtained by chemical analysis.....	4.25

GLASSWARE AND ACCESSORIES

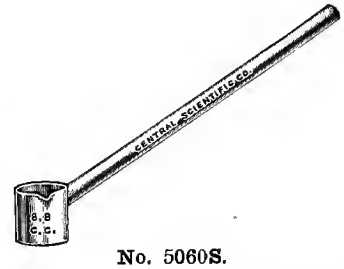
FOR MILK AND BUTTER TESTING

Arranged Alphabetically

No. 9650.



No. 5060T.



No. 5060S.

9650. **ACID BOTTLE, Combined.** By tipping the bottle forward and then letting it come back to upright position the pipette will fill with 17.5 cc. of acid..... $ 3.00

9652. **ACID BOTTLE TRUNNION.** Convenient for handling No. 9650 Acid Bottle. Base of wood covered with lead, which is not acted on by sulphuric acid. Bottle automatically returns to position after tipping..... 1.50

5060T. **ACID BURETTES.**

Number of charges of 17.5 c.c.	3	6	12	25
Each	2.00	2.00	2.50	3.00

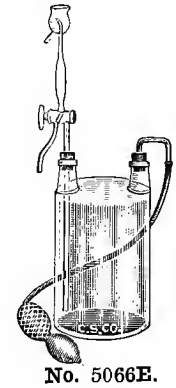
9655. **ACID BURETTES.**

Number of charges of 8.8 c.c.		6	12	25
Each		2.00	2.50	3.00

5060R. **ACID DIPPER, Nafis' Style,** 17.5 c.c. Per dozen..... 3.00

5060S. **ACID DIPPER, Nafis' Style,** 8.8 c.c. Per dozen..... 3.00

No. 5060U.



No. 5066E.

5060U. **ACID MEASURE,** cylindrical jar with lip, 17.5 c.c. Per dozen..... 1.0

9659. **ACID MEASURE,** cylindrical jar with lip, 8.8 c.c. Per dozen..... 1.0

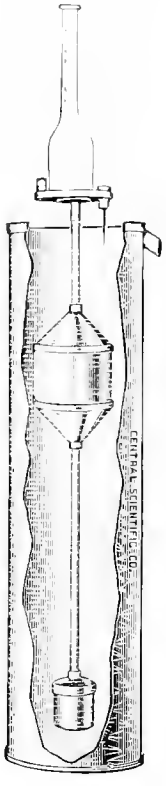
5066E. **ACID PIPETTE, Automatic, Farrington's.** Consists of a two-neck Woulff bottle, one neck being fitted with a No. 5124A Automatic Pipette, delivering 17.6 c.c.; the other neck with a No. 4613 Double Rubber Bulb. Complete..... 5.0

For **ACIDOMETER** see page 87.

For **ACID TESTS** see page 96.

For **ALKALINE TESTS** see page 96.

For **APRONS** see page 119.



No. 9663.

9663. **CREAM BALANCE, Wisconsin Hydrostatic.** This balance has been devised to meet the demand for a simple and correct method of weighing cream into test bottles and consists of a specially devised brass float, which is placed in a cylinder of water. The instrument is weighted so as to float in a vertical position and has at the top a small pan on which a cream bottle and a 9-gram weight are placed. By means of an adjustable pin point, the point to which the float sinks in water is readily marked. The 9-gram weight is then taken from the pan and the cream to be tested is weighed by dropping it slowly into the bottle with a pipette until the float sinks to the same point it reached with the weight on the pan, when the test bottle will contain exactly 9 grams of cream. Very accurate weighings can be made with this instrument and as there are no bearings to rust it will retain its sensitiveness indefinitely. Complete with metal cylinder, float, and 9-gram weight, but without bottle.....**Net** $ 3.50

For other **BALANCES** for Milk and Cream Testing see pages 125-6.

SAMPLE BOTTLES AND JARS

4550A. **BOTTLES, Round,** metal screw capped, for samples. Caps cork lined.

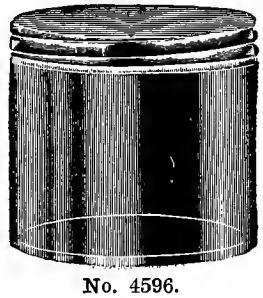
Capacity, ounces.....	2	4	8
Per dozen.....	.75	1.05	1.30

4550B. **BOTTLES, Square,** metal screw capped, for samples. Caps cork lined.

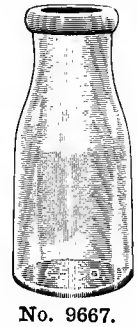
Capacity, ounces.....	2	4	8
Per dozen.....	.75	1.05	1.30

No. 4547.

No. 5065.



No. 4596.



No. 9667.

No. 9668.

4547. **BOTTLES,** "Salt Mouth," flint glass, mushroom stopper, for composite tests.

Capacity, pints.....	½	1	2
Per dozen.....	1.50	2.10	2.90

5065. **BOTTLES, Aluminum Screw Cap,** for holding samples of cream. With cork washer. One ounce capacity. Per dozen..... .90

4596. **BOTTLES,** glass, with metal screw cap; valuable for samples, etc.

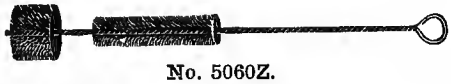
Capacity, ounces	2	4	8
Per dozen	.65	.80	1.05

9667. **MILK JARS** for composite tests. These are the cheapest and best sample bottles in use and being made of fine flint glass will stand much hard usage.

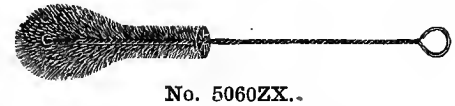
Capacity, pints.....	½	1	2
Per dozen.....	.60	.66	1.25

9668. **CAPS, Tin,** for No. 9667 Milk Jars. Will fit either size, and keep out dirt and impurities. Per dozen..... .20

BRUSHES



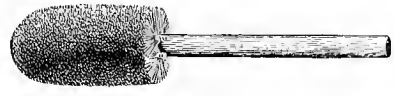
No. 5060Z.



No. 5060ZX.

5060Z. **BRUSHES,** for cleaning 10 per cent Milk Test Bottles. Per dozen..... $0.55

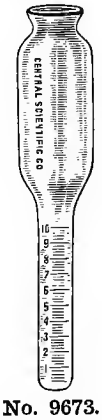
5060ZX. **BRUSHES,** for cleaning Cream Test Bottles. Per dozen..... .55



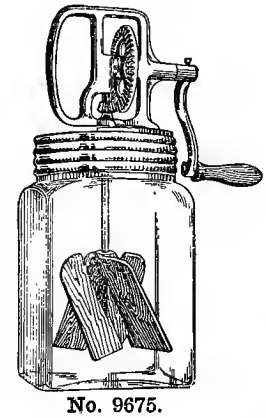
No. 4608.

4608. **BRUSH,** with wooden handle, for cleaning No. 9667 Milk Jars. 12 inches long. Four rows of bristles. Each..... .25

For other **BRUSHES,** see page 138.



No. 9673.



No. 9675.

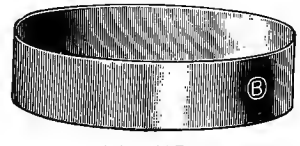
9673. **CASEIN TUBE,** Hart's, for estimating amount of casein in milk. To be used in any Babcock Milk Tester. Per dozen..... 3.0(

For **CHART** of **DAIRY COW,** see page 189.

9675. **CHURNS, Dazey Family.** Small churns for family and experimental use. Jars of glass, so that process can be watched, and square to prevent racing of cream and give double agitation. Aluminum-coated castings, heavily nickeled cap, hardwood turbine dasher, heavily tin-plated dash rod, smooth-running gears. Directions furnished with each churn.

No.	20	30	40
Will hold, pints	5	7½	9
Will churn, pints	2½	3¾	4½
Price	1.55	1.95	2.50

For **CREAMOMETER,** see next page.

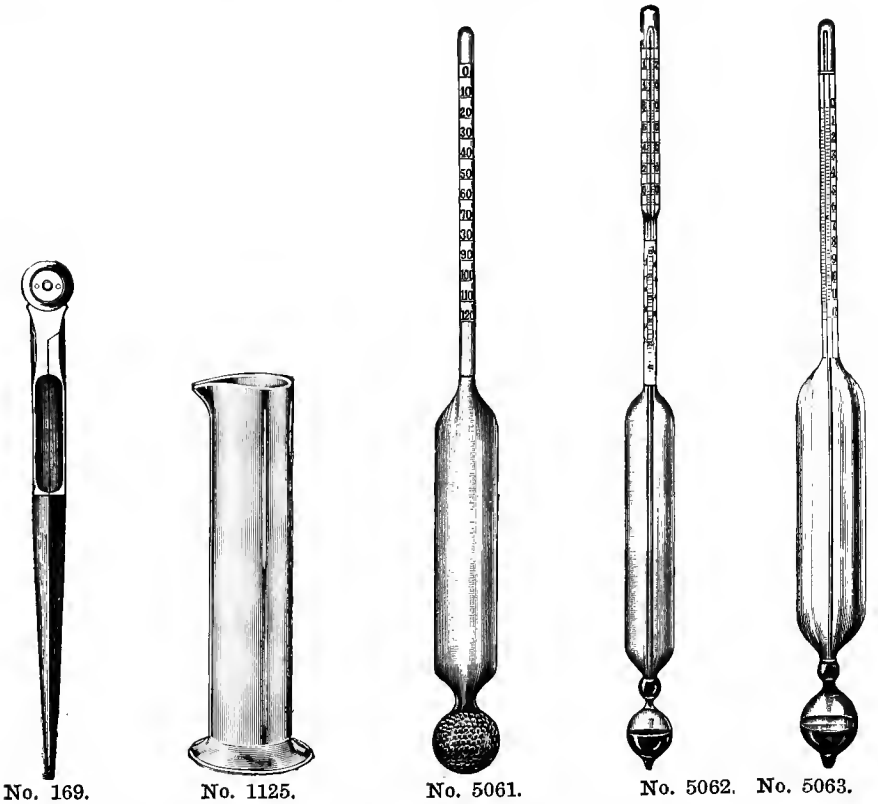


No. 4853.

4853. **DISHES, Milk,** of aluminum, flat bottom, straight sides.

Diameter, inches	2	3	4
Height, inches	½	¾	1
Each	.21	.33	.50

For other **DISHES** see page 146.



No. 169. No. 1125. No. 5061. No. 5062. No. 5063.

169. **DIVIDERS, Plain Brass,** for reading graduations on test bottles.

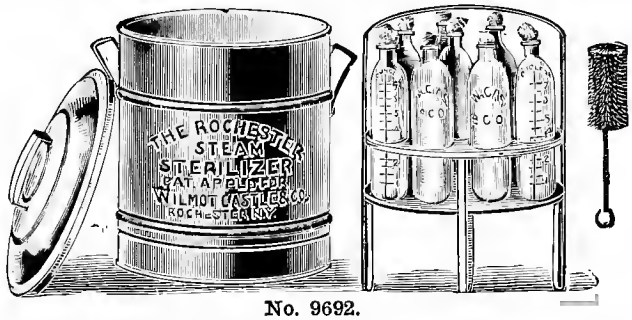
Length	4½ in.	5½ in.
Each	$0.25	.30

1125. **HYDROMETER JAR,** with lip. For holding milk in testing with lactometers.

Size, inches	10 x 1½	12 x 2	15 x 2	15 x 3	18 x 3
Each	.30	.38	.50	.83	1.10

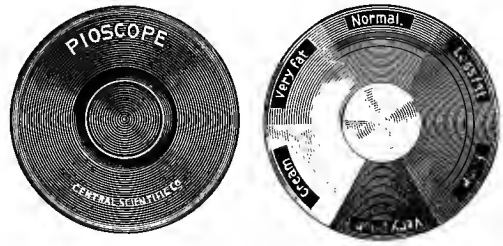
LACTOMETERS

5061. **LACTOMETER, Common,** graduated 0° to 120° in 2° divisions..... $ 0.45
5062. **LACTOMETER, Quevenne's,** with thermometer combined 1.65
5062A. **LACTOMETER, Quevenne's,** without thermometer ..... .65
5063. **LACTOMETER, Spence's,** N. Y. State Board of Health pattern, with thermometer.. 1.65
9685. **LACTOMETER, Spence's,** N. Y. State Dairy Commission pattern, 0° to 120° in 2° divisions, with thermometer, correction scale and certificate..... 3.25
5063A. **CREAMOMETER, Chevalier's,** to show percentage of cream..... .67
9690. **PAPER, Fat Free,** for Milk Analysis, Schleicher & Schuell's No. 571, for determination of fat, according to Adams' method. Per box of 50 strips, 560x65 mm....Net 1.75



No. 9692.

9692. **PASTEURIZING OUTFIT** for steam or hot water. Consists of a neatly finished vessel with convenient handles and cover, and with rack for holding eight sterilizing bottles. Beads around the Sterilizing Chamber mark the points to which water should be filled. Complete with bottles and a brush for cleaning.....Net 2.50



No. 9694.

9694. **PIOSCOPE, or MILK TESTER, Heeren's.** For showing the richness of milk by color comparison. A set of appropriately labeled standard colors is furnished, together with a convenient means of comparing with the standards the color assumed by the sample of milk during the test..... $ 0.75

No. 5060L.

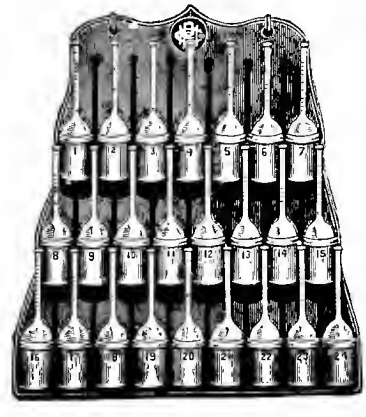
5060L. **PIPETTE, Milk,** 17.6 c.c. Per dozen..... 1.50
5060M. **PIPETTE, Cream,** 18 c.c. Per dozen..... 1.50
5060N. **PIPETTE, Milk and Cream,** 17.6-18 c.c. combined. Per dozen..... 2.00
5060P. **PIPETTE, Cream,** 9 c.c. Per dozen..... 1.50
5060Q. **PIPETTE, Milk,** 8.8 c.c. Per dozen..... 1.50
9696. **PIPETTE, Milk,** 17.6 c. c., in accordance with the specifications formulated by the Bureau of Standards and adopted by the Official Dairy Instructors Association and by the State of Indiana. Per dozen..... 2.75
9697. **PIPETTE, Milk,** 17.6 c. c., in accordance with the specifications formulated by the Dairy and Food Commission of Wisconsin. Per dozen..... 2.75

5121. **PIPETTES, Volumetric.**

Capacity, c.c.	1	5	10	12	15	20	25	30	50	75	100	200
Each	.09	.13	.17	.20	.21	.22	.27	.30	.33	.40	.45	.60

PRESERVATIVES

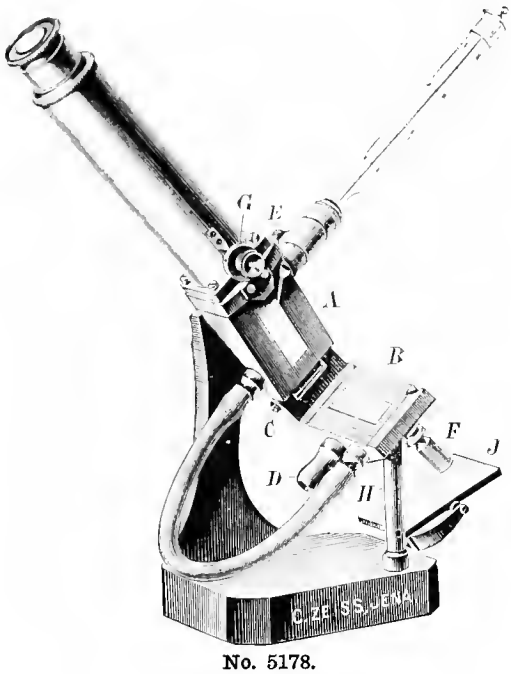
5066A. **TABLETS, Corrosive Sublimate,** for keeping milk samples sweet. Used in making composite tests. Will color samples so that danger of mistakes is avoided. Small size, will keep samples sweet for two weeks. Per box of 50 tablets..... .22
5066B. **TABLETS, Corrosive Sublimate,** same as No. 5066A, but large size, will keep samples sweet for four weeks. Per box of 50 tablets..... .33



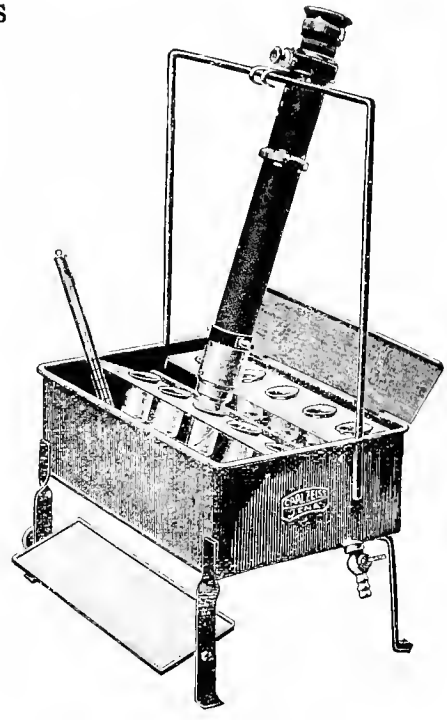
No. 9711.

9711. **RACK, for Babcock Test Bottles,** of tin. Hangs flat against the wall; the bottles stand upright and are easily filled. Capacity 24 bottles..... 1.65

REFRACTOMETERS



No. 5178.



No. 5179.

5178. **REFRACTOMETER** for Butter Examination. Although primarily intended for refractometric examination of butter, may be used also for testing fats, food oils, etc. Ocular scale gives values between n_D=1.42 and n_D=1.49. Furnished with micrometer screw for measuring one-tenth scale divisions; accuracy in measurement 1 unit in the 4th decimal place. Complete with bottle of standard liquid, for verifying the adjustment of the ocular scale, table for converting scale divisions into refractive indices, and vice versa, and a common thermometer graduated from 0 to 50 degrees C. in 1½ degree divisions, and fitted with a screw thread for attaching to the instrument, in a case.....Duty Free $ 51.00

5178A. **THERMOMETER, Wollny's Special,** with scale for butter and for lard. This thermometer gives the highest allowable refractometrical values between 30 and 40 degrees C. Furnished with screw thread for attaching to instrument.....Duty Free 1.40

5179. **REFRACTOMETER, Dipping,** for investigating fluids of low refractive index, especially dilutions, alcoholic, volatile solutions, etc. (scope of the ocular scale from n_D= 1.325 to n_D=1.367), accuracy in measurement 1/3 unit of the 4th decimal; with free standing refractometer prism of acid-proof glass, with attachable beaker for the investigation of quickly evaporating solutions and with a table for the conversion of the scale readings into refractive indices, in case.....Duty Free 62.50

5179A. **HEATING TROUGH A,** for the reception of 12 glass beakers (each containing 20 c.c.) for investigations in bulk, with a glass plate in the bottom of the trough and mirror below, with 24 glass beakers.....Duty Free 7.50

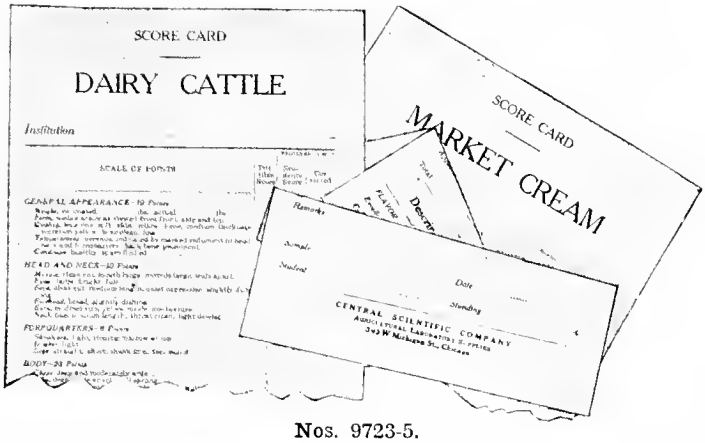
5179B. **HEATING TROUGH B,** with glass plate in the front side and mirror....Duty Free 4.00

5179C. **THERMOMETER,** 15–25° C., graduated to 1/10°, with protecting metal case and certificate of proof.....Duty Free 4.25

5179D. **STEM THERMOMETER,** 15–25° C., graduated to 1/5°, about 8 cm. in length with a red line at 17.5° C.....Duty Free .60

5179E. **SPIRAL HEATER** .....Duty Free 15.25

5179F. **AUXILIARY PRISM** for investigating fluids in very small quantities and deeply colored solutions with unpolished surface of contact slightly countersunk..Duty Free 3.00



Nos. 9723-5.

SCORE CARDS

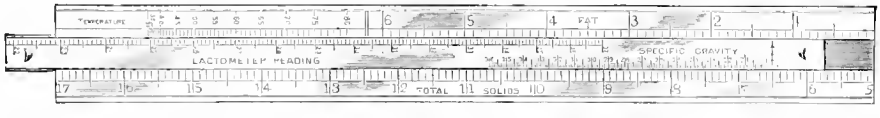
Our Score Cards listed below will be found a convenience and a necessity to all who once use them. These cards are carefully compiled and are so complete that they oft-entimes direct the students' attention to points overlooked. Put up in tablets of 50 sheets.

9723. **SCORE CARDS, Dairy Cattle.** Per tablet of 50 sheets..... $ 0.20

9725. **SCORE CARDS, Market Cream.** Per tablet of 50 sheets.. ..... .20

No. 9727.

9727. **SIEVE, Horse Hair,** for straining buttermilk; 8 inches in diameter.....Net .50

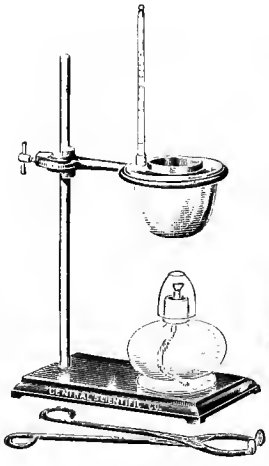


No. 5067.

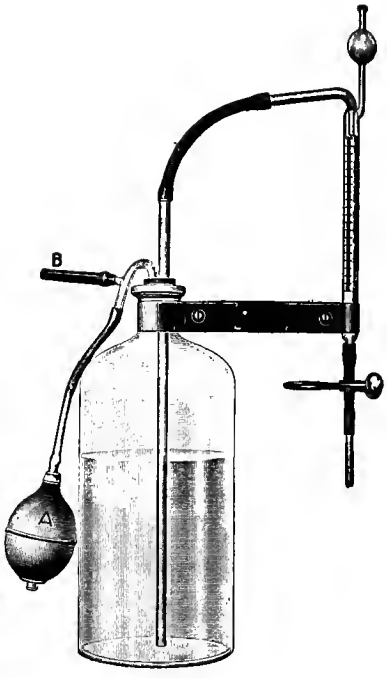
5067. **SLIDE SCALE, Richmond's,** for calculating the total solids in milk, with scale for temperature correction of specific gravity. This slide rule will be found of great advantage and service to cheese factorymen and milk inspectors, as well as those interested in the preparation and examination of milk for use of children and invalids.. 3.50

TESTS

No. 9730.
Patent Applied For.



No. 9734.



No. 9731.

9730. **ACID TEST, Marschall,** for accurate determination of the acidity of milk, cream, and whey. Exceedingly simple, and equally valuable for the beginner and the expert. Considered a necessity by all first-class butter and cheese makers. Set includes Combined Burette and Bottle for neutralizer, 9 c. c. Pipette, Bottle of Indicator, and half gallon Bottle of Neutralizer. Complete .....Net $ 4.00

9731. **ACID TEST, Nafis'.** This acidity testing apparatus is automatic, easy to manipulate, and self-adjusting. The liquid instantly readjusts itself to zero so that the only reading to be taken in using the apparatus is at the point on the graduated scale where the liquid surface is located after the sample is neutralized. Complete as illustrated, together with Neutralizer, 9 c. c. Pipette, Stirring Rod, Beaker, 2-ounce Bottle of Indicator, and full directions.....Net 3.75

9732. **STIRRING ROD, Nafis' Faultless,** for use in acidity tests. This rod is hollow and contains a piece of wool of the exact color which the sample of milk should have when the acidity test is complete.....Net .15

ALKALINE TESTS

We recommend the Farrington Alkaline Tablets for use in determining the degree of acidity of milk, cream, or whey. These tests are valuable in selecting milk for pasteurization, for butter or cheese making; for testing cream during ripening in order to trace the progress of its souring and show whether fermentation should be hastened or checked so that the cream may be in the right condition for churning at a certain time; and to show whether it is safe to mix two lots of cream. For these tests the three items listed below will be needed.

5001. **GRADUATED CYLINDER,** 100 c. c..... .56

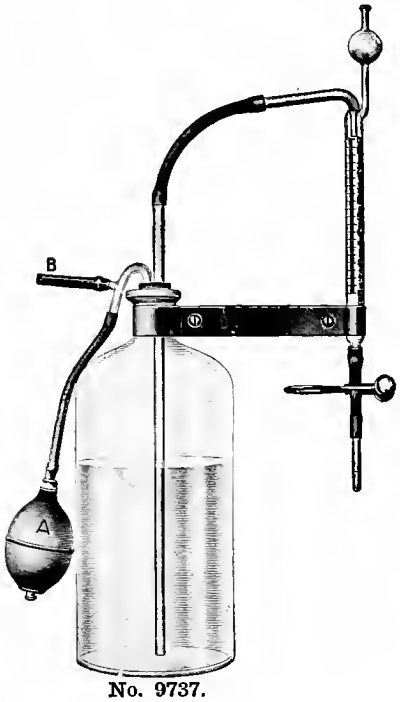
5060L. **PIPETTE,** 17.6 c. c..... .15

5066C. **ALKALINE TABLETS, Farrington's.** Per box of 50 tablets..... .25

9734. **MOISTURE TEST, Ames.** The apparatus consists of a jacketed paraffine container made of copper. The outside shell has a rounded bottom to expose as much surface as possible to the heat from an alcohol lamp. An aluminum sample cup fits closely within the inside shell, [illegible] t the heat from the paraffine is transmitted [illegible] ated support stand, special thermometer rea[illegible], alcohol lamp, tongs for lifting the sample cup, and full directions .....Net 5.00

9736. **RENNET TEST, Marschall.** A simple, reliable and indispensable aid to every cheese maker. It enables the maker to ascertain the condition of the milk, and to regulate its ripening to an exact point, alike every day, which is very essential in order to insure uniform work and uniform quality of the cheese. Includes Graduated Cup (A), a 1 c.c. Pipette (B), a Bottle (C) in which to dilute the rennet, and a spatula (D) for stirring the milk. Complete in a handsome case.....Net $ 2.50

No. 9736.
Patented U. S. A., Jan. 21, 1896.



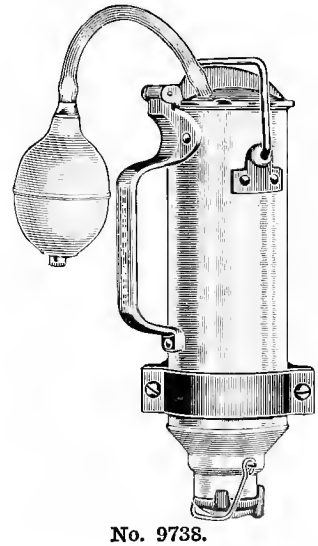
No. 9737.

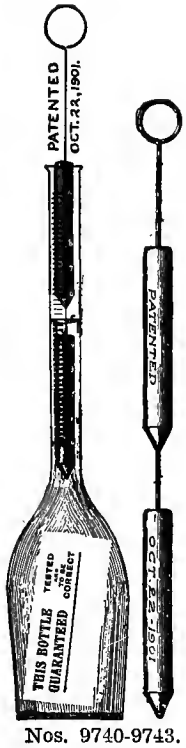
9737. **SALT TEST FOR BUTTER, Nafis.** This apparatus is automatic, easy to manipulate, and self-adjusting, and is especially suited for rapid determinations of the per cent. of salts in butter. The liquid in the graduated tube instantly readjusts itself to zero so that the only reading to be taken in using the apparatus is at the point on the graduated scale where the liquid surface is located after the test is completed. With a 10-gram sample of butter each c.c. of solution drawn from the burette will equal ½ per cent. salt in the butter. Complete as illustrated together with 10 gram Weight, 250 c.c. Flask, Standard Solution in dry form, 25 c.c. Pipette, Porcelain Cup, Stirring Rod, Medicine Dropper, Beaker, 2-ounce Bottle of Indicator, and full directions....Net 5.00

9737A. **STIRRING ROD, Nafis' Faultless,** for use in No. 9737 Salt Test. This rod is colored to show the exact tint taken by the sample when the test is complete.....Net .15

9738. **SEDIMENT TESTER** for milk, as described by Professors Babcock and Farrington. Consists of a cylinder 2½ inches in diameter and 6 inches long, funnel shaped at the bottom and terminating in an opening about 1 inch in diameter. In the cap at the bottom is a wire gauze strainer on which a thin disc of absorbent cotton is placed. After a pint sample of milk has been filtered through the apparatus, the cotton filter, with the dirt which it has collected, is detached and allowed to dry. The amount of dirt obtained will differ with different lots of milk and the discs when dry may be returned to the milk producer as evidence as to the cleanliness of the milk. The central cylinder is surrounded by a steam or hot water jacket with ½ inch intervening space so that the milk can be kept hot and the filtering process thereby hastened. Complete with 500 discs and with bracket for mounting against a wall..Net 10.00

9738A. **DISCS, Absorbent Cotton,** for use with No. 9738 Sediment Tester. Per box of 100.....Net .35


No. 9738.



Nos. 9740-9743.

No. 5064.

No. 5064A.

9740. **TEST-BOTTLE TESTER, Nafis,** for use with Babcock Test Bottles. Can be used successfully by anyone. Substantially made of brass. Always ready for use and will test for the two important points of the scale without removing it from the bottle.

To make a test it is only necessary to fill the bottle with alcohol deeply colored with black aniline or writing ink until it is almost opaque (this does away with the meniscus) so that the highest point is exactly even with the "0" mark. Water, milk or any other liquid may be used with good results, but adhering drops should first be removed from the neck with a strip of blotting-paper. Then slowly lower the Tester into the bottle until the liquid rises half way between the two sections. At that point should be the middle mark. After that point is tested for and its accuracy established, slowly lower the entire Tester into the bottle so that the liquid rises over the top of the upper section about an eighth of an inch. If the liquid is even with the top mark and was also at the middle mark, the bottle is correct. For 6-inch, 10% Milk Test Bottle.....Net $ 0.75

9741. **TEST-BOTTLE TESTERS, Nafis.** Same as No. 9740, but for 6-inch Cream Test Bottles.

Order letter	A	B	C
Per cent	30	40	50
Price, each .....Net	1.00	1.50	1.50

9742. **TEST-BOTTLE TESTER, Nafis.** Same as No. 9740, but for 6-inch, 9-gram, 50% Cream Test Bottles .....Net 1.50

9743. **TEST-BOTTLE TESTERS, Nafis.** Same as No. 9740, but for 9-inch Cream Test Bottles.

Order letter	A	B	C
Per cent	30	50	55
Price, each .....Net	1.50	1.50	1.50

5060V. **TEST TUBES, Butter Fat Oil,** plain, 9 x ¾ inches. Per dozen..... 1.00

5060W. **TEST TUBES, Butter Fat Oil,** with line 5 inches from bottom. Per dozen..... 1.00

5060Y. **TEST TUBES, Cream,** heavy, for samples, 5 x 1¼ inches. Per dozen..... 55

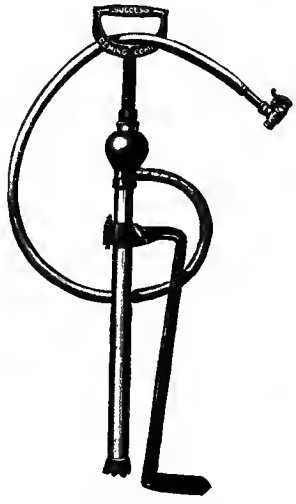
DAIRY THERMOMETERS.

5064. **THERMOMETER, Dairy;** 8 inches long. Weighted to float upright..... .25

5064A. **THERMOMETER, Dairy.** The easiest reading instrument for dairy use. The combination of a blue spirit column with a white scale and large black figures show up the reading with great distinctness, notwithstanding the obscuring effect of the milk. Eight inches long, will float upright..... .30

5064B. **THERMOMETER, Dairy,** standard, for those who wish a more accurate thermometer than the ordinary. Hand-written paper scale, one degree graduation, accurate within one division of the scale, weighted with shot and guaranteed to float upright. Ten inches long. Approximate scale range 10 to 110 degrees Fahrenheit..... .80

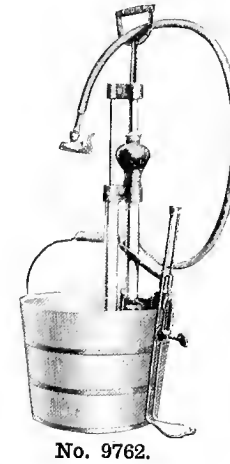
9753. **THERMOMETER, Pasteurizing,** with enclosed hand-written paper scale; approximate scale range 30 degrees to 220 degrees Fahrenheit; graduated in 2 degree divisions and accurate within one division of the scale ..... .80



No. 9760.

ENTOMOLOGY

For Full Line of Entomological Apparatus and Supplies See Catalog N.



No. 9762.

9760. **BUCKET SPRAYER** for general spraying in the garden, green house, and small orchard. The working parts and cylinder are of brass, so that corrosion and rust are eliminated. The air chamber, which is the globe shaped enlargement seen in the illustration at the top of the cylinder, is of cast brass and causes ease of motion and discharge of a steady stream. The handle and foot rest are made of malleable iron, which is unbreakable, and the latter being 15 inches long, is suitable for use with any tall bucket. Complete with No. 9774 Bordeaux Nozzle and 3 feet of ⅜-inch hose..... $ 4.50

9762. **BUCKET SPRAYER**, similar to No. 9760, but with the addition of a Hydraulic Agitator and of a combination foot rest and bucket clamp by means of which the bucket and pump are held together so that they are as one integral part and may readily be carried from place to place in one hand. By means of the Hydraulic Agitator the spraying mixture is kept thoroughly stirred so that this is the most complete and satisfactory bucket sprayer on the market. The pump and air chamber are of brass as described under No. 9760. Complete with No. 9774 Bordeaux Nozzle and 4 feet of ⅜-inch hose, but without bucket..... 6.65

No. 9765.

No. 9765 (in use).

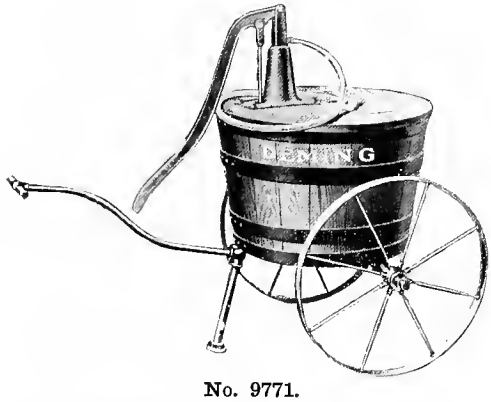
9765. **KNAPSACK SPRAYER** for general spraying purposes The working parts of the pump are the same as described under No. 9760 so that corrosion and rust are eliminated. The lever is of wrought iron with malleable iron link, steel rod and wood handle. The tank is of 5 gallons capacity and is made of brass with wide shoulder straps. It is provided with a drip cup to take care of possible leakage, a gauze strainer under the filling hole, and a wide footrest so that it may be used as a bucket pump. Complete with No. 9774 Bordeaux Nozzle and 5 feet of ⅜-inch hose, with discharge pipe and undersprayer..... 18.00

No. 9770.

No. 9770 (in use).

9770. **TRACTOR SPRAYER.** This is a spraying outfit of the wheelbarrow type and may readily be operated by one man. The tank has a capacity of 12 gallons and the entire sprayer, although built for durability, is as light in weight as is consistent with the proper strength. All parts of the pump coming in contact with the liquid are of brass, thus doing away with corrosion. The pump has a 1½-inch cylinder with 4-inch stroke and is provided with an agitator for the spraying liquid. The handles are of wrought iron pipe bent to shape and are connected rigidly by channel iron for holding the tank. The wheel is 20 inches in diameter with tire 2½ inches wide. As shown in the illustration, the pump is worked by gear wheels, the main gear being attached to the main wheel and the operating gear being so arranged that it may be thrown out of mesh when it is desired to move the sprayer without spraying. This sprayer is especially efficient for spraying two rows of field crops, as shown in the small illustration, and is provided with two sections of ⅜-inch hose 2 feet long, two ⅜-inch stop-cocks, two ¼-inch hose pipes 18 inches long, and No. 9776 Demorel Nozzles with angle discharge. Complete with galvanized tank of 12 gallons capacity ..... $ 25.00

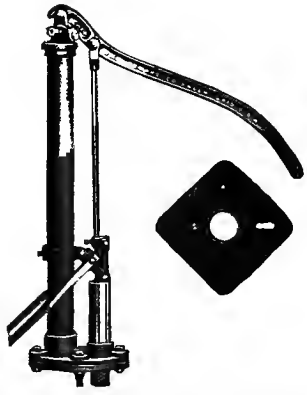
9770A. **TRACTOR SPRAYER,** same as No. 9770, but with brass tank 35.00



No. 9771.

No. 9771 (in use).

9771. **TANK SPRAYER.** This is one of the most convenient outfits for general use. Consists of a 24-gallon wood tank with steel hoops and hinged wood top, mounted on a cart with 24-inch metal wheels having staggered spokes and 2-inch tires; leg, tongue and handle of wrought iron pipe; height to top of tank 30 inches; to top of pump 42 inches. The working parts are of brass and since the leverage is six to one, the pump may readily be worked against a pressure of 125 pounds. The air chamber is ample and the agitator, which is of the twin paddle type, is simple and effective and stirs the liquid thoroughly. Complete with No. 9774 Bordeaux Nozzle and 6 feet of ½-inch discharge hose 20.00

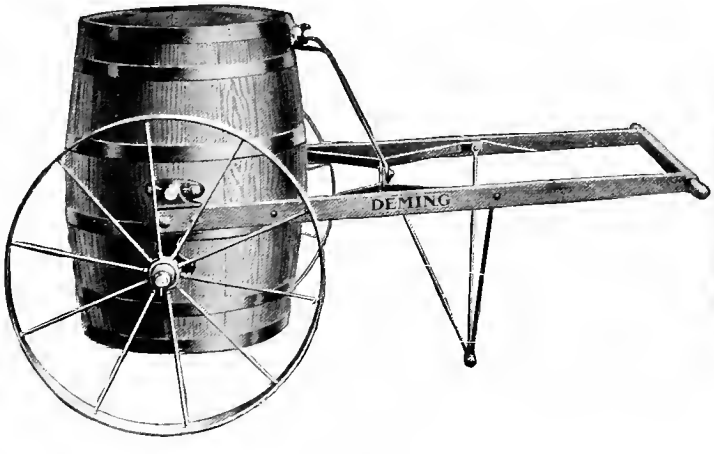


No. 9772 (with detail of base).

No. 9772 (in use).

9772. **BARREL SPRAYER.** The pump has a brass tube cylinder 2¼ inches in diameter with 4-inch stroke, brass ball valves, cage and seat. It sits low in the barrel so that the cylinder is submerged. The iron base for mounting the pump on the head of barrel is adjustable and fits a hole 10 x 10 inches. This sprayer is fitted with air chamber, gauze suction strainer, agitator of the twin paddle type, and brass discharge Y, but without hose or nozzle (see No. 9772A). For barrel see No. 9773..... $ 13.50

9772A. **HOSE AND NOZZLE** for No. 9772. 12½-foot section of ½-inch sprayer hose with couplings and No. 9777 Simplex Nozzle..... 4.50

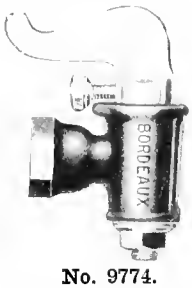


No. 9773.

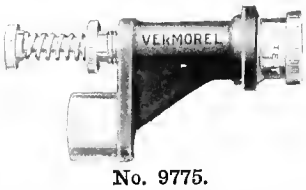
No. 9773 (in use).

9773. **BARREL CART** for use with No. 9772 Sprayer. A 50-gallon barrel is mounted on a cart provided with a frame of wrought iron and wood well braced and having 32-inch metal wheels with tires 2½ inches wide. By detaching the brace which steadies the barrel and then lifting the handle, the barrel can be set on the ground and the cart removed. Complete as illustrated..... 16.65

For **CHART** on **SPRAYING**, see page 189.



No. 9774.



No. 9775.

No. 9776.

No. 9777.

9774. **NOZZLE, Bordeaux.** This is an excellent general purpose spray nozzle and throws a solid stream, coarse long-distance spray, or a fine mist, or it may be shut off altogether. Suitable for general spraying, whitewashing, disinfecting, etc..... $ 1.00

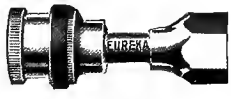
9775. **NOZZLE, Vermorel,** with caps for fine and coarse sprays, suitable for kerosene sprayers 1.00

9776. **NOZZLE, Demorel,** similar to No. 9775 Nozzle, but somewhat lighter in weight..... .75

9777. **NOZZLE, Simplex.** Light and durable in construction and adapted for high pressure; has two interchangeable steel spray discs, one coarse and one medium fine..... .75

No. 9778.

No. 9779.



No. 9780.

No. 9783.

No. 9784.

9778. **NOZZLE, Simplex Angle,** same as No. 9777, but with angle connection..... .75

9779. **NOZZLE, Spramist.** Similar to No. 9777 Nozzle, but with cup-shaped removable strainer 1.25

9780. **NOZZLE, Eureka,** for throwing a conical shape spray. Especially suitable for whitewashing ..... .75

9783. **NOZZLE, Acme,** for throwing a solid stream or fine spray ..... .50

9784. **NOZZLE, Fire,** for fire protection, washing windows, buggies, etc..... .50

No. 9790.

9790. **HYDROMETER, Lime-Sulphur,** for testing the lime-sulphur wash used in spraying. With this Hydrometer the strength of the solution can be accurately known so that the operator may be certain that when it is applied to the tree it is strong enough to destroy the scale. Complete with directions, including instructions for mixing the lime-sulphur wash ..... .45

9790A. **HYDROMETER,** similar to No. 9790, but of higher grade. (See page 189.)..... .90

INSECTICIDES

	Prices Net.				
	4 oz.	8 oz.	1 lb.	Bulk.	
Arsenate of Lead, dry.....	$0.18	$0.30	$0.50	5 lb.	$2.25
Arsenate of Lead, paste.....	.10	.18	.25	5 lb.	1.10
Arsenate of Soda, dry.....	.12	.22	.35	5 lb.	1.50
Arsenite of Lime, dry.....	.10	.18	.30	5 lb.	1.25
Bordeaux Mixture, dry.....	.10	.18	.25	5 lb.	1.00
Carbon Bisulphide	..	..	.33	50 lb.	8.00
Cyanide of Potassium (for generating Hydrocyanic Acid Gas).....	.15	.27	.40	5 lb.	1.75
Hellebore	.10	.18	.25	5 lb.	1.00
Kerosene Emulsion, per qt.....	.40	..	..	1 gal.	1.25
Lime, Unslaked (Quicklime), lumps.....	..	..	.15	5 lb.	.50
Lime, Unslaked (Quicklime), powd.....	..	.12	.20	5 lb.	.90
Lime, Slaked	..	..	.10	5 lb.	.40
London Purple	..	..	.25	...	...
Paris Green	.15	.25	.40	5 lb.	1.75
Pyrethrum (Persian Insect Powder).....	.15	.27	.40	5 lb.	1.80
Sulphate of Copper, powd.....	.10	.15	.20	5 lb.	.75
Sulphur, powd.....	..	..	.10	5 lb.	.30
Sulphur and Lime Mixture.....	..	.12	.20	5 lb.	.90
Tobacco Stems	..	..	.10	5 lb.	.25
Whale Oil Soap.....	..	.10	.15	5 lb.	.65

LIFE HISTORIES OF NORTH AMERICAN INSECTS

Mounted dry in "Riker's Specimen Mounts." (See next page for prices of Mounts only.)

ILLUSTRATING METHOD OF MOUNTING.

NOXIOUS INSECTS

LEPIDOPTERA.

Butterflies and Moths.

		Prices Net.
8951A.	**Pieris rapae,** cabbage butterfly	$ 2.75
8951B.	**Euvanessa antiopa,** mourning cloak	3.00
8951C.	**Carpocapsa pomonella,** codling moth	3.50
8951D.	**Laphygma frugiperda,** fall army worm	2.50
8951E.	**Leucania unipunctata,** army worm	2.50
8951F.	**Ocneria dispar,** gypsy moth	3.50
8951G.	**Protoparce carolina,** tomato sphinx	4.00
8951H.	**Protoparce celeus,** potato or tobacco sphinx	4.00
8951J.	**Sannina exitiosa,** peach borer	2.75
8951K.	**Heliothis armigera,** boll-worm, corn worm o tomato worm	3.00
8951L.	**Euproctis chrysorrhoea,** brown tail moth	3.00

COLEOPTERA.

Beetles.

8952A.	**Doryphora decemlineata,** potato bug	2.50
8952B.	**Anasa tristis,** squash bug	2.75
8952C.	**Macrodactylus subspinosus,** rose bug	3.00
8952D.	**Passalus cornutus,** horn bug	3.75
8952E.	**Anthronomus grandis,** cotton boll weevil (Mexican)	2.00
8952F.	**Saperda candida,** apple borer	2.75
8952G.	**Conotrachelus nenuphar,** plum-curculio	3.50
8952H.	**Diabrotica vittata,** striped cucumber beetle	2.75
8952J.	**Dermestes lardarius,** larder beetle	2.75

Continued on next page.

LIFE HISTORIES—Continued

ORTHOPTERA.

Grasshoppers, Locusts, Etc.

Prices Net.

8953A. **Termes fatalis**, white ant ..... $ 10.50
8953B. **Gryllus campestris**, field cricket 2.75
8953C. **Gryllus domesticus**, house cricket 2.75
8953D. **Gryllotalpa vulgaras**, mole cricket 2.75
8953E. **Melanoplus spretus**, Rocky Mountain locust 2.75

BENEFICIAL INSECTS

LEPIDOPTERA.

8956. **Bombyx mori**, silkworm 4.75

COLEOPTERA.

8957A. **Necrophorus americana**, carrion beetle 3.50
8957B. **Coccinella novempunctata**, ladybug 3.50

HYMENOPTERA.

8959. **Apis mellifica**, honey bee 7.00

MIMICRY

REAL MIMICRY.

Butterflies that closely resemble in form and color species which birds and insects will not attack on account of the poisonous taste.

8960. **Limenitis dissipus**, same color and markings as **Danais archippus**, which is not molested 2.75

PROTECTIVE COLORATION.

Mimicry of Color Only.

8960A. **Catocala relicta** (''white ribbon''), showing male and female, also one specimen at rest on birch bark 4.00
8960B. **Catocala amatrix** (''red ribbon''), showing male and female, also one specimen at rest on bark 2.50

Mimicry of Color and Form.

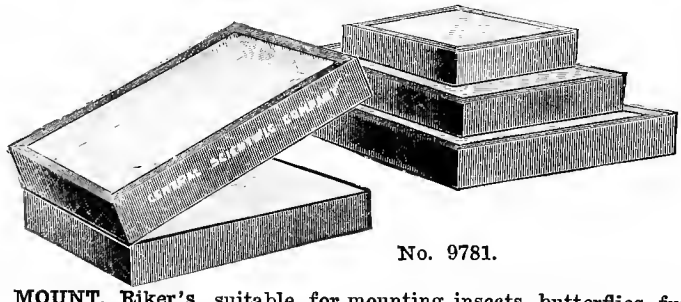
8960C. **Kallima inachus** (leaf butterfly), mimicking a leaf to perfection in both color and form (from East India) 4.00
8960D. **Anisomopha buprestoides** (walking-stick), from Florida 1.75
8960E. **Phasma gigantes** (giant walking-stick), with wings, male and female (from East India) 10.00
8960F. **Valgus candiculatus** and others. Three insects that imitate buds of twigs 2.50

WARNING COLORS AND FORM.

8960G. **Caligo oilus** (owl butterfly), mimicking an owl's head 4.50
8960H. **Attacus atlas** (cobra-head moth), mimicking a snake's head 4.50
8960K. **Papilio blumei**, green banded East Indian butterfly 3.00
8960L. **Morpho cypris**, blue butterfly from Brazil, the most gorgeous butterfly in the world 3.00

(**Note.**—The last two butterflies scare away birds by their loud colors.)

SPECIMEN MOUNTS



No. 9781.

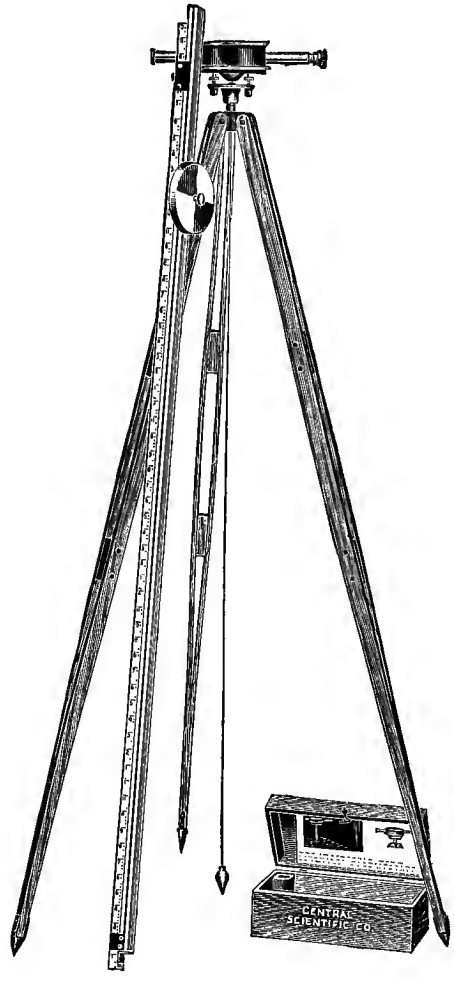
9781. **SPECIMEN MOUNT, Riker's**, suitable for mounting insects, butterflies, fungi, shells, etc., or thick bulbs or plants too large for the Botanical Mounts, No. 9782.

Size, inches	2½ x 3	4 x 5	5 x 6	6½ x 8½	8 x 12	12 x 16
Price ..... Net	.12	.15	.19	.23	.40	.80

9782. **BOTANICAL MOUNT, Riker's**, suitable for mounting any botanical specimen. The mount consists of two parts—a thin plate of photographic glass to which narrow flaps of linen morocco paper are neatly fastened, and a cardboard back to which is glued a thin layer of sterilized surgical cotton in which the specimens are imbedded.

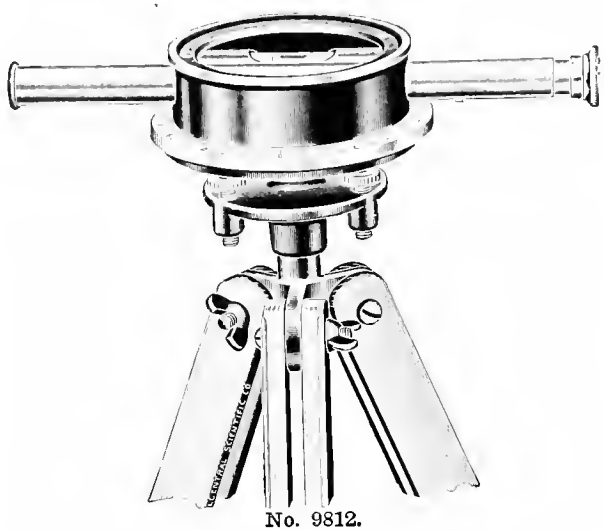
Size, inches	5 x 6	6½ x 8½	8 x 12	12 x 16
Price ..... Net	.19	.23	.40	.80

FARM SURVEYING



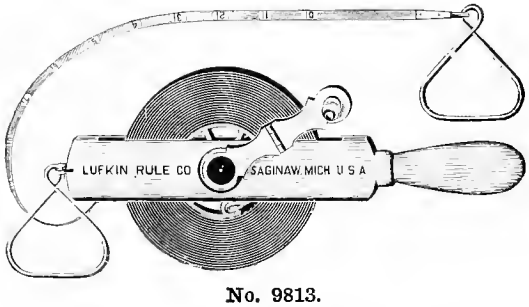
No. 9811.

9811. **FARM LEVEL, Bostrom's Improved.** Built upon lines radically different from those followed in making other levels; accurate, durable, and complete, and so simple that anyone with ordinary intelligence can quickly learn to do satisfactory work with this instrument. Meets every requirement in all farm work for which a level is needed, such as Terracing, Ditching, Tile Draining, Irrigating, Road Building, Grading, Leveling Foundations, Running Fences, and Setting Out Orchards. The telescope has a clear field and a magnifying power of eight diameters which enables the cross on the target to be read at a distance of one-quarter of a mile in any direction. A circle graduated in degrees is provided for obtaining angles, squaring up buildings, and all such work. Included in the outfit is a sliding target rod, graduated in feet, inches, and quarter inches, telescoping to five feet when closed and to nine and one-half feet when extended, and having sliding target of usual form with thumb-screw for securing in any position. The metal parts are of iron and brass, and the wood parts, including the target, are of pine. Complete in neat wood box with tripod, sliding target rod, target and plumb bob.....Net $ 15.00

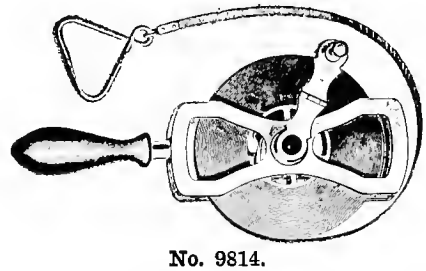


No. 9812.

9812. **FARM LEVEL, Bostrom's Improved.** Similar to No. 9811, but more substantial and of finer finish. The telescope has a magnifying power of twelve diameters so that the instrument has a much greater range and all wood parts are of hardwood and all metal parts of brass except the target. Complete in neat wood box with tripod, sliding target rod, target and plumb bob .....Net $ 25.00



No. 9813.



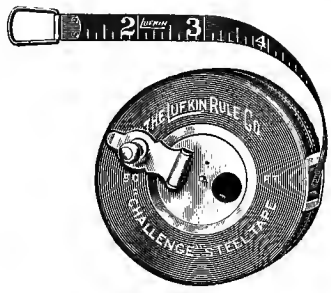
No. 9814.

9813. **TAPES, Surveyors' Chain.** Heavy ¼-inch steel tape; nicely finished hardwood reel, with metal folding handle and two large and strong detachable rings. Trimmings nicely nickel plated. Graduated in feet, with end feet in tenths, or in links, with end links in tenths, graduations etched on.

Length .....100 feet.	200 feet.	300 feet.	100 links.	200 links.	300 links.
Each 6.67	10.00	14.00	5.55	7.80	10.00

9814. **TAPES, Surveyors' Chain,** graduated on Babbitt Metal. This Tape will answer the requirements of the most severe usage and take the place of the old-time steel chain. It is made of practically unbreakable steel, heavily coated with white metal to prevent rusting and corrosion, and somewhat heavier than the ordinary chain tape. The graduations are stamped into Babbitt Metal at each foot (end feet in tenths), or at each link (end links in tenths), so that the graduations can readily be felt as the tape is allowed to pass through the hand. Each Tape is provided with a pair of detachable handles, and the reel, which is built especially for such Tapes, has a nickel-plated frame with folding winding handles and is a very serviceable reel, easily wound and of beautiful finish.

Length .....100 feet.	200 feet.	300 feet.	100 links.	200 links.	300 links.
Each 6.67	10.40	12.70	5.85	9.20	10.40



No. 9816.

9816. **TAPES, Steel Measuring.** Metal lined hard leather case, nickel-plated trimmings, folding winding handle opened by pressing pin on opposite side. Tape ⅜ inch wide and marked in feet, tenths, and hundredths. Measurements guaranteed accurate.

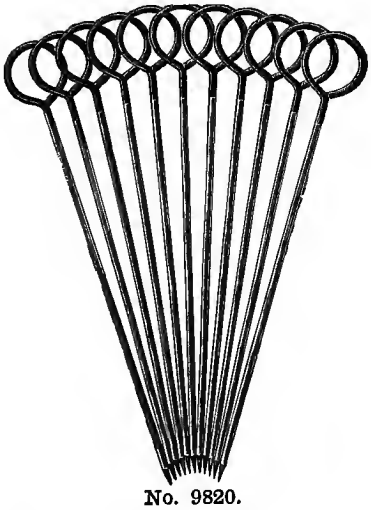
Length, feet	50	100
Each	$4.00	6.75

9817. **TAPES, Metallic Measuring.** Hard leather cases, folding handles, nickel-plated trimmings, tape ⅝ inch wide, made of best woven linen with metallic warp, marked on one side in tenths of feet and on the other side in links.

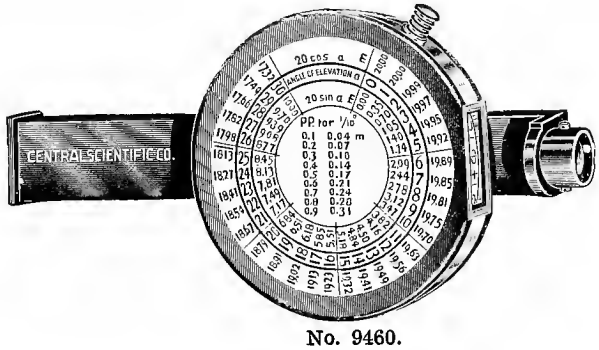
Length, feet	50	100
Each	2.60	4.20

Instantaneous

Note.—The above Measuring Tapes (Nos. 9816 and 9817) are provided with a new marking by means of which instantaneous readings of both feet and inches can be made without the necessity of referring back to the last entire foot. The method is well shown in the accompanying illustration.



No. 9820.



No. 9460.

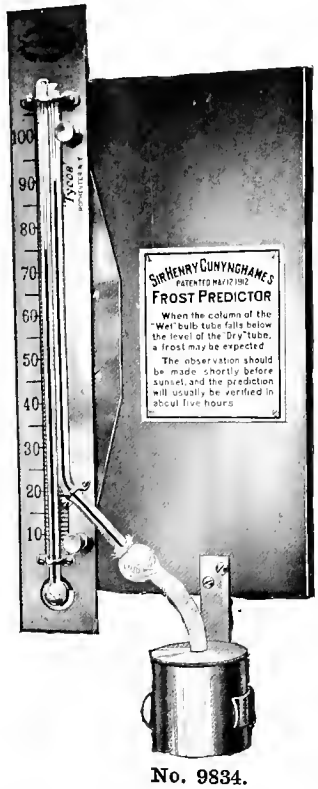
9820. **SURVEYOR'S ARROWS** made of 9/64 inch round steel fourteen inches long, and with rings enameled in bright vermilion. Per set of eleven..... $ 1.10

9460. **HYPSOMETER** for measuring heights of trees, buildings, etc. Consists of sight tube and balance circle Clinometer. Complete in a leather case with table and instructions for use.....Duty Free 10.50

For other **SURVEYING INSTRUMENTS** see pages 74-5.

FARM METEOROLOGY

No. 9831.


SIR HENRY CUNYNGHAME'S
PATENTED MAR 12 1912
FROST PREDICTOR
When the column of the "Wet" bulb tube falls below the level of the "Dry" tube, a frost may be expected
The observation should be made shortly before sunset, and the prediction will usually be verified in about five hours

No. 9834.

9831. **AUTOMATIC ALARM THERMOMETER.** A sensitive, accurate, durable instrument for giving an alarm the instant the temperature registers a given degree.

Consists of a straight mercury tube, into the bore of wnich a fine platinum wire is fused at 32° F., or at any other degree desired. Through a non-sparking Relay Attachment a bell is made to ring, at practically any distance from the thermometer itself, at the exact moment the temperature where the instrument is located reaches the danger point. Simply but strongly constructed and fully protected by a heavy metal weather-proof case, which, however, allows perfect circulation of air at all times. It may be installed by any one of average intelligence, and under ordinary conditions should render valuable and accurate service for a lifetime.

May be installed in three different ways: (1) One thermometer and simple alarm; (2) More than one thermometer and simple alarm; (3) More than one thermometer and annunciator alarm showing exact location of danger point.

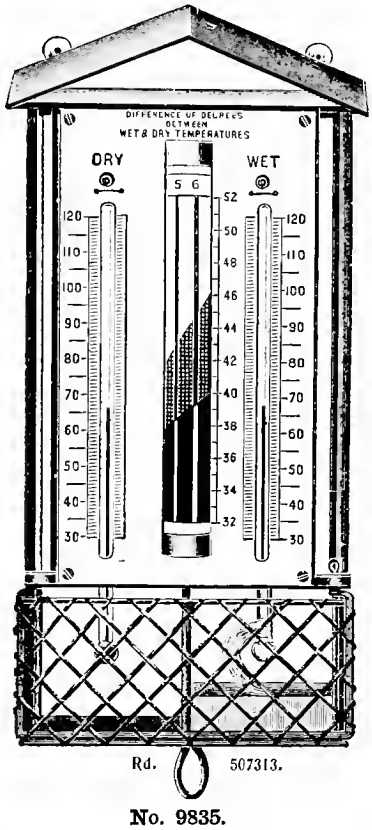
In ordering, be sure to mention the temperature at which alarm is to be given.

Thermometer, with relay, but without batteries, bell, or wire..... $ 20.00

9832. **AUTOMATIC ALARM THERMOMETER.** Similar to No. 9831, but arranged to ring at either of two temperatures desired, which must be mentioned when ordering.

Thermometer, with relay, but without batteries, bell, or wire..... 27.00

9834. **FROST PREDICTOR, Cunynghame's.** This predictor does away with the necessity of carefully consulting two thermometer tube and computing their readings from tables, of working over a printed chart, or of operating some mechanical device. It therefore saves time and overcomes all possible chance of error due to careless thermometer readings or miscalculations. Consists of two thermometers mounted side by side on a non-corrosive scale of zinc. One bulb is exposed to the air temperature and the other has a wick attached which dips into a metal cup filled with water. When the level of the mercury in the right-hand thermometer falls below the level in the left-hand thermometer (a fact which may be determined by simple inspection and which cannot take more than a few seconds to observe) a frost may be expected. When the readings are taken after sundown, the prediction is usually verified about five hours after the observation. Complete as described..... 7.5(



No. 9835.

9835. **HORTICULTURAL HYGROMETER.** An instrument for ascertaining in a simple manner the likelihood of a frost during the night, based on the principle that in the evening "the dew point determines the minimum temperature of the night," and if this dew point be below freezing point, it is only fair to presume that there will be a frost during the night. Shows in a simple manner, without the use of tables, whether the dew point is below freezing, and consequently, whether frost may be expected.

The instrument is a wet and dry bulb Hygrometer, with a special cylindrical scale revolving between the thermometers. The cylinder is figured in three sections, which are intended to apply as follows: (1) White Section, Frost highly improbable. (2) Shaded Section, Frost doubtful. (3) Black Section, Frost very probable. The cylinder has 10 lines numbered 1, 2, 3, 4, up to 10; these represent the difference of degrees between the readings of the Wet and Dry Thermometers.

The method of observing is as follows: Note first the Dry Bulb reading, then the Wet Bulb reading, and the difference between the two. Turn the cylinder (by means of the handle) until the line and figure representing this difference is at the right-hand side of the opening. Look down the scale on the right-hand side of the opening, and the Wet Bulb reading (just observed) will fall opposite one of the three sections. From this the observer knows whether frost is likely to occur during the night.

The instrument consists of a steel plate and steel cylinder on which the divisions, figures and letters are permanently enameled. This gives legibility, durability, cleanliness. The tubes of the thermometers are at the back of the scale, and thus well protected, whilst the wire covering guards the bulbs. The whole is mounted on a solid iron frame cast in one piece, with lugs for attaching to wall.....Duty Free **$ 7.00**

For other **METEOROLOGICAL INSTRUMENTS**, see Catalog M.

9900. **AGRICULTURAL CHARTS**, see page 189.

MICROSCOPE SLIDES

OF

TYPICAL PLANTS AND THEIR PATHOLOGICAL CONDITIONS

The slides listed below are prepared under the direction of an expert in plant pathology at one of the prominent Agricultural Colleges. They will prove of special value in the study of certain typical plants, and in enabling the student to learn to identify many of the more common plant diseases.

1. **Wheat Starch Granules,** fresh and eroded.
2. **Cross Section of Bean Leaf,** Phaseolus vulgaris.
3. **Bean Root Tubercles,** Pseudomonas radicicola.
4. **Cross Section of Carnation,** Dianthus caryophyllinus.
5. **Cross Section of Mushroom,** Coprinus micaceus.
6. **Yellow Water Lily,** Nymphaea advena.
7. **Clover Dodder,** Cuseuta trifolii.
8. **Apple Bitter Rot,** Glomerella rufomaculans.
9. **Apple Black Rot,** Sphaeropsis malorum.
10. **Apple Scab,** Venturia pomi.
11. **Blackberry Canker,** Nectria cinnabarina.
12. **Blackberry Leaf Spot,** Septoria rubi.
13. **Cherry Shot-Hole,** Cylindrosporium padi.
14. **Currant Leaf Spot,** Septoria ribis.
15. **Currant Rust,** Puccinia ribis.
16. **Grape Anthracnose,** Gloeosporium ampelophagum.
17. **Grape Black Rot,** Guignardia bidwellii.
18. **Grape Downy Mildew,** Rhysotheca viticola.
19. **Grape Powdery Mildew,** Uncinula necator.
20. **Peach Brown Rot,** Sclerotinia fructigena.
21. **Peach Leaf Curl,** Exoascus deformans.
22. **Peach Scab,** Cladosporium carpophilum.
23. **Pear Leaf Spot,** Septoria pyricola.
24. **Pear Scab,** Venturia pyrina.
25. **Plum Black Knot,** Plowrightia morbosa.
26. **Plum Pockets,** Exoascus pruni.
27. **Raspberry Anthracnose,** Gloeosporium venetum.
28. **Raspberry Cane Blight,** Leptosphaeria coniothyrium.
29. **Raspberry Rust,** Gymnoconia peckiana.
30. **Carnation Rust,** Uromyces caryophyllinus.
31. **Chestnut Bark Disease,** Diaporthe parasitica.
32. **Maple Tar Spot,** Rhytisma acerinum.
33. **Timber Destroying Fungus,** Trametes pini.
34. **Rose Mildew,** Sphaerotheca pannosa.
35. **Rose Rust,** Phragmidium subcorticium.
36. **Asparagus Rust,** Puccinia asparagi.
37. **Bean Anthracnose,** Colletotrichum lindemuthianum.
38. **Cabbage Club Root,** Plasmodiophora brassicae.
39. **Cucumber Anthracnose,** Colletotrichum lagenarium.
40. **Tomato Leaf Spot,** Septoria lycopersici.
41. **Corn Rust,** Puccinia zeae.
42. **Corn Smut,** Ustilago maydis.
43. **Cotton Anthracnose,** Colletotrichum gossypii.
44. **Oat Smut,** Ustilago avenae.
45. **Wheat Bunt, or Stinking Smut,** Tilletia foetans.
46. **Wheat Rust,** Puccinia graminis, Aecidial Stage; occurs on Barberry. The spores from this stage infect the Wheat, producing the Telial Stage (Slide No. 47).
47. **Wheat Rust,** Puccinia graminis, Telial Stage. (See Slide No. 46.)
48. **Rye Ergot,** Claviceps purpurea.
49. **Pore Fungus,** Boletus versipellus.
50. **White Rust of Crucifers,** Albugo candida.

9951. **SET OF SLIDES.** 25 or more chosen from the above list. Per slide.....Net $ 0.30
9951A. **SINGLE SLIDES.** Each.....Net .35

For **PLANT DISEASE SPECIMENS** see page 186.

LANTERN SLIDES FOR AGRICULTURE

WAGER AND BOWLIN'S

The following list of slides is from the work of Prof. Ralph E. Wager, head of the Biological Science Department of the Northern Illinois Normal School, and Wm. R. Bowlin, of the Englewood High School, Chicago.

These slides are accurate, scientific records, expertly made. All slides are from large original negatives, unless otherwise stated. Scientists in too many cases are careless or inexpert in photographic processes, but in this case complete mastery of photographic technique is combined with careful, scientific observation, and the result is a long list of modern views of surpassing excellence.

PRICES

Plain slides, each.....Net $0.40
Colored slides, each.....Net .75

Plain slides will be sent unless otherwise specified.

FARM STOCK

Photographs of Pedigreed Animals True to Their Type

HORSES

CLYDESDALE

*636-19 Mare and Foal, both well pedigreed.
636-18 Horse, two years old—side view.
636-21 Horse, three years old—side view.
*636- 5 Horse, four years old—side view.
636- 6 Same Horse—rear view.
*636- 7 Horse, four years old, dappled coat—side view. The dapple was the original Clydesdale type.
636- 8 Same Horse showing rear view—well-shaped legs.
636- 9 Front View of same Horse.
636-10 Front Legs and Feet of Clydesdale—side view. Excellent conformation.

PERCHERON

636-11 Horse, two and one-half years old—side view—very good type.
636-12 Same Horse—rear view.
*636-24 Horse, four years old—three-quarter view.

TROTTING HORSE

*636-22 Horse, four years old—side view. Extraordinary animal. Son of Tom Miller.

ENGLISH HACKNEY

*636-26 Side View.

SUFFOLK PUNCH

*636-27 Side View.

BELGIAN

*636-28 Mare—side view.

SHETLAND

*636-29 Pony—side view.
636-30 Pony hitched to cart.

JACK

*636-31 High-bred Type.

CATTLE

GUERNSEY

*636- 3 Registered Bull—side view.
*636-32 Fine Type of Guernsey Cow—side view.
*636-33 Same—rear view, showing the udder.
636-34 Three-quarter View of same Cow.
*636-35 View of Rear Third of Body, showing udder and milk veins.
*636-36 Calf, full blood—side view.
636-37 Front View of Cow.

JERSEY

*636-38 Registered Bull—side view.
636-39 Registered Cow—side view.
636-40 Rear View of same cow.
636-41 Front View of same cow.
636-42 Three-quarter View of cow.
636-43 Rear Third of Body.
*636-44 Jersey Cow and Calf.
637-45 Three-quarter Jersey (Grade) Cow, showing effect of type.
*636-46 Same Cow with Calf, sired by full blood Jersey.

AYRSHIRE

*636-47 Ayrshire Bull—side view.
*636-90 Ayrshire Cow—side view.

HOLSTEIN-FRIESIAN

*636-48 Registered Bull—side view.
*636-49 Registered Cow—side view.
636-50 Same Cow—rear view.
636-51 Three-quarter View, from rear.
*636-52 Rear Third of Body, showing udder.
636-53 Yearling Heifer—side view.
636-54 Two-year Heifer—side view.

BROWN SWISS

*636-55 Herd of Brown Swiss Cattle.
*636-56 Cow and Calf.
636-57 Registered Cow—three-quarter view, from rear.
637-58 Registered Cow—side view.
*637-59 Registered Bull—side view.

SHORTHORN

*636-60 Registered Bull—side view.
636-61 Registered Bull among herd of grade cows and calves.
*636-62 Shorthorn Cow—side view.
636-63 Same—front view.
636-64 Same—rear view.

HEREFORD

*636-65 Hereford Bull—side view.
636-66 Same—front view.
636-67 Same—rear view.
*636-68 Hereford Cow—side view.
636-69 Same—front view.
636-70 Same—rear view.

ABERDEEN ANGUS

*636-71 Bull—side view.
*636-72 Cow—side view.

POLLED DURHAM

*636-73 Polled Durham Bull—side view.
*636-74 Polled Durham Cow—side view.

DUAL PURPOSE

*636-25 Highly Bred Cow—side view. Calf beside her. From the best herd in existence.

LANTERN SLIDES—Continued

FARM STOCK

Continued

SHEEP

AMERICAN MERINO

*636-75 Fine Type of Ram.
*636-76 Flock of Sheep in pasture.

DELAINE MERINO

*636-77 Young Ram. Well developed wool type.

SOUTHDOWN

*636-81 Southdown Ewe.

RAMBOUILLET

*636-78 Herd of Rambouillets in paature.
*636-79 Ram. Excellent type.
*636-80 Ewe, characteristic type.

SHROPSHIRE

*636-82 Type ram.

SWINE

POLAND CHINA

*636-83 Male. Good configuration.
*636-84 Sow and Pigs.
636-13 Large Poland China Sow. Fair type.

DUROC-JERSEY

*636-87 Excellent Type of Sow.

CHESTER WHITE

*636-89 A Group in Pasture.
*636-85 Sow—close view.

BERKSHIRE

*636-86 Fine type of boar.
*636-88 Group of sows. Extra fine.

* Slides marked with an asterisk, 50 in number, constitute a set admirably adapted for elementary work in type studies.

FARM PROCESSES

ALFALFA

631-31 Unloading Limestone from car.
631-32 Limestone piled ready for spreading.
631-33 Loading Limestone into manure-spreader.
631-34 Spreading Limestone on field by means of the manure-spreader.
631-61 Seeding Alfalfa.
631-35 Cutting Alfalfa; rear of outfit.
631-36 Cutting Alfalfa; front of outfit; 30-acre field.
631-37 Raking Alfalfa with side-delivery rake; rear view.
631-38 View of Side-delivery Rake in operation.
631-39 Loading Alfalfa with loader. Outfit in operation.
631-40 View of Outfit from the side.
631-41 Hoisting Alfalfa from load into barn—silo beside barn.
631-42 Curing Alfalfa in cocks covered with canvas caps.
633- 3 Field of Alfalfa; along one margin is a strip uninoculated, showing the effect of the absence of bacteria.

OATS

631-23 Discing Corn Stubble. Two four-mule teams in large field.
631-24 One of the Outfits in operation. Rear view.
631-25 Seeding Oats, rear view. Seeder in operation.
631-26 Filling the Seeder with oats.
631-27 Discing after Seeding. Rear view of outfit.
631-28 Harrowing after Seeding. Harrow often follows disc.
631-54 Harvesting Oats.
631-55 Threshing Oats.
633- 8 Field of Oats infected with curley dock (Rumex crispus).
633- 9 Field of Oats infected with mustard (Brassica arvensis).

CORN

631- 9 Discing for Corn. Two four-mule teams.
631-10 Dragging (harrowing) the ground after discing.
631-11 Planting with check-row planter.
631-14 Check-row Planter, from rear; shows wire and marker.
631-15 Check-row Planter, in operation, from in front. Shows wire, marker, position of team with reference to each, planted and unplanted areas, etc.
631-16 Planter at close range. Shows wire, trip, etc.
631-18 Changing the Wire at the edge of the field.
631-19 Old Between-row Cultivator, in operation, side view.
631-12 Two-row (Tower) Plow, in operation, rear view. First plowing, corn 6-8 in. high.
631-13 Second Plowing, two-row plow, three horses, taken from rear. Corn 12-18 in. high.
631-17 Cutting Corn by hand.
631-46 Husking Corn in the field. Using wagon and team.
631-47 Shelling Corn with corn sheller.
631-48 Corn Crib, filled with corn.
631-49 Shredding Corn for ensilage.
631-50 Filling the Silo with ensilage.
631-52 Shredded Corn in stack. New method of keeping it.
631-53 Cattle in field of corn, fattening.

CLOVER

631-56 Field of Clover. Very heavy—red and white.
631-57 Closer View of red and white clover plants.
631-58 Cutting Clover with machine.
631-59 Raking Clover with horse rake.
631-60 Loading Clover with loader.

RYE

632-11 Heads of Rye affected with ergot. (Claviciceps purpurea.)

WEEDS FOUND IN FARM CROPS

5831-15 Black Bind Weed. (Persicaria convolvulus.)
5835-14 Violet Wood Sorrel. (Oxalis violacea.) Plants in grass.
5837- 1 Water Hemlock. (Circuta maculata.)
5838- 2 English Plantain. (Plantago lanceolata.)
5832-16 Wild Garlic. (Allium canadense.)
5832-28 Star Grass. (Hypoxia hirsuta.)
5832-38 Lamb's Quarter. (Chenopodium album.) In corn.
5832-18 Pig Weed. (Amaranthus retroflexus.)
5831- 9 Squirrel Tail Grass. (Hordium jubatum.)
5839- 1 White Daisy. (Chrysanthemum leucanthemum.)
5839- 2 Black-eyed Susan. (Rudbeckia hirta.) Habitat.
5839- 7 Common Chickory. (Cichorium intybus.)
5839- 9 Rosin Weed (Silphium integrifolium) and Cone-Flower (lepachys pinnata) in group.
5839-11 Rosin Weed or Compass Plant (Silphium laciniatum.)
5839-12 Dog Fennel. (Anthemis cotula.)
5839-13 Prickly Lettuce. (Lactuca scariola.)
5839-16 Daisy Fleabane (Erigeron ramosus) in clover.
5839-17 Dog Fennel. (Anthemis cotula.) Habitat.
5839-26 Yarrow. (Achillea millefolium.) Habitat.
5839-31 Burdock. (Arctium minus.)
5839-32 Canada Thistle. (Cirsium arvensium.)
5839-33 Ragweed. (Ambrosia artemisifolia.)
5839-34 Great Ragweed. (Ambrosia trifida.)
5837-10 Milkweed. (Aaclepius pumila.) Habitat.
5838- 9 Jimson Weed (Datura tatula) in corn.
5838-19 Common Plantain. (Plantago major.)
580- 3 Yarrow, Burdock, Canada Thistle and Squirrel Tail in typical waste-place group.
580- 4 Lamb's Quarter, Pigweed and Ragweed in the edge of corn.
580- 5 Jimson Weed, Lamb's Quarter, Pigweed and Velvet Leaf (Arbutilon theophrasti) in corn.
633- 8 Oats infected with Curly Dock. (Rumex crispus.)
633- 9 Oats infected with Mustard. (Brassica arvenais.)
633- 7 White Sweet Clover (Melliotus alba) in group with burdock and yellow dock.
586-10 Velvet Leaf. (Arbutilon theophrasti.)
683- 6 Yellow Sweet Clover (Melliotus officinialis) in field of clover.
5831-11 Couch Grass. (Agropyrom repens.)
5831-12 Tumble Weed. (Amaranthus graecizans.)
5831-13 Sheep Sorrel. (Rumex acetocella.)
5831-14 Bind Weed. (Convolvulus sepium.)
5831-17 Plant and Fruit of the Cocklebur, growing along railroad track suggesting a method of seed carrying.
5831-18 Common Purslane. (Portulaca oleracae.)

For Prices See Page 111

LANTERN SLIDES—Continued

ECONOMIC INSECTS

632- 1 Work of Corn Bill-bug. (Horizontal rows of punctures in leaf.)
632- 2 Work of Corn Ear-worm. Larva shown in the ear.
632- 3 Life History of Corn Ear-worm. From State Bulletin.
632- 4 Stages in life of Corn Root Aphis. With attendant Ant. From State Bulletin.
632- 6 Stages in life of June Beetle. (Larva, White Grub.) From State Bulletin.
632- 6 Stages in life of Chinch Bug. From State Bulletin.
632- 7 Lateral aspect of Differential Locust. (Coloptenus differential.)
632- 8 Dorsal aspect of Differential Locust.
632- 9 Work of Codling Moth. Diagrammatic.
632-10 Grasshopper on rose leaf.
632-16 The Cottony Scale killing a branch of silver maple.
632-17 Row of Silver Maples ruined by cottony scale.
632-18 Washing a Maple Tree with kerosene and soap to kill cottony scale.
632-22 Crab Apple Branch infected with San Jose scale.
632-13 San Jose scale much magnified.
632-14 Life History of the Cabbage Butterfly (Pieris rapae) copied.
632-15 Life History of the Colorado Potato Beetle. (Leptinotarsa decemlineata.) Copied.
632-19 The 12-point Asparagus Beetle on asparagus.
632-20 The Onion Maggot (Pegomya cepetorum) destroying bulb.
632-21 Spraying by means of gasoline power spray with solution of calcium sulphid.
59578- 1 Larvae of Cecropia Moth (Samia cecropia) one day old.
59578- 2 Larvae of Cecropia Moth (Samia cecropia) after first moult.
59578-2a Larvae of Cecropia Moth (Samia cecropia) after second moult.
59578- 3 Larvae of Cecropia Moth (Samia cecropia) after third moult.
59578- 4 Larvae of Cecropia Moth (Samia cecropia) after fourth moult.
59578- 5 Larva moulting (fourth.)
59578- 6 Cocoon of Cecropia on Japanese quince. (Large form of cocoon.)
59578- 7 Cocoon of Cecropia on hawthorn in bloom, showing small form of cocoon.
59578- 8 Cocoon of Cecropia cut open to show pupa and larval skin.
59578- 9 Cecropia Moth, wings spread, dorsal aspect. On Japanese quince, in bloom.
59578-10 Cecropia Moth, wings closed, lateral aspect. On Japanese quince.
59578-11 Two Swallowtail Butterflies on geranium and orchid blossom.
59578-12 Larvae of Polyphemus (Telia polyphemus) one day old.
59578-13 Larvae of Polyphemus (Telia polyphemus) adult, on basswood, two cocoons showing.
59578-13a Adult of Polyphemus—wings spread, female.
59578-14 Tomato Sphynx Larva well covered with larval cocoons of ichneumon parasites.
59578-15 Three Larvae of Interrogation Butterfly (Grapta interrogationis) on elm. One larva suspended ready to moult into chrysalis.
59578-16 Three Chrysalids of Interrogation Butterfly on elm twigs.
59572- 1 Angular Winged Katy-did (Microcentrum laurifolium) among leaves of honeysuckle. Somewhat dorsal view.
59572- 2 Angular Winged Katy-did, as above, lateral view. Excellent for protective resemblance.
59575- 1 Milkweed Bugs (Oncopeltus faciatus) on fruits of Milkweed. Both nymphs and adults shown.
59575- 2 Similar to above. Different view.
59575- 3 Similar to above. Different view.
59572- 3 Differential Locust (Melanoplus differentialis) on barberry leaf. Dorsal aspect.
59572- 4 Same Locust, lateral aspect.
59572- 5 Differential Locust on bare twig. Lateral aspect.
59572- 6 Grasshopper (Orchelimum, male) on rose leaf.
59578-17 Corn Ear-worm, on ear.
59578-18 Larvae of Monarch Butterfly (Anosia plexippus) on Milkweed.
59578-19 Larva of Monarch spinning pad of silk on which to pupate.
59578-20 Larva of Monarch spinning pad of silk. Different view from above.
59578-21 Larva of Monarch attached to pad of silk, about to moult.
59578-22 Chrysalis of Monarch, immediately after moulting into the pupal stage. Larval skin still attached. Lateral aspect.
59578-23 Chrysalis, lateral aspect. Suspended on Milkweed leaf.
59578-24 Chrysalis, ventral aspect. Suspended on Milkweed leaf.
59578-25 Chrysalis of Monarch, about to be ruptured by adult, the colors of which show through the chrysalidal case.
59578-26 Adult Monarch, on Blossoms of Sweet William.
59576- 1 Hickory Borer on Golden Rod.
59572- 7 Carolina Locust (Disosteira carolina) on ground. Protectively colored.
59572- 8 Carolina Locust on ground, nearer view than above.
59572- 9 Carolina Locust on Arborvitae. Detail excellent.
59575- 4 Woolly Aphids on twig of Hawthorn.
59578-27 Larva of Mourning Cloak Butterfly (Vanessa antiopa) on Willow twig.
59578-28 Larva as above, different view.
59578-29 Chrysalis of Mourning Cloak, on Willow twig.
59578-30 Adult Mourning Cloak on Milkweed leaf. Wings closed, lateral aspect.
59578-31 Adult Mourning Cloak, wings open on blossom of Milkweed.

HORTICULTURE

Made for the most part in the fruit country of Idaho.

634-22 Apple Tree just set.
634- 1 Delicious Apple Tree, one year from setting, head forming.
634-23 View of Orchard, second summer from setting, peach tree fillers.
634- 3 Jonathan Apple Tree, third summer, excellent head.
634- 4 Rome Beauty Apple Tree, third summer from setting.
634- 5 Newtown Pippin, third summer from setting.
634- 2 View of Well Cultivated Orchard, third summer from setting.
634- 7 Jonathan Tree, fourth summer from setting.
634- 8 Newton Pippin, fourth summer from setting.
634- 6 View of Well Cultivated, Irrigated Orchard, fourth summer from setting. Shows growth over 634-2.
634-10 Jonathan Tree, fifth summer from setting.
634-24 View of Orchard, fifth summer from setting.
634-25 Jonathan Apple in bloom, fifth spring from setting. Perfect head. Shows method of pruning.
634-28 Newtown Pippin in bloom. Fifth spring from setting. Excellent type.
634-27 Mature Apple Tree in bloom.
634-26 Mature Plum Tree in bloom.
634-29 Elberta Peach Tree, second summer from setting.
634-30 Peach Tree, after pruning, third spring from setting.
634-11 Early Harvest Tree heavily laden with fruit, fifth summer.
634-12 Gano Apple Tree, fruit laden, sixth summer.
634-13 Bartlett Pear Tree, heavily laden.
634-14 Peach Tree, heavily fruited.
634-15 Peach Branch, heavily fruited.
634-16 Close View of a Branch of Red Raspberry, large fruit, perfect type.
634-17 View of the Mountainous Region of Idaho, forest covered
634-18 View of a Group of Large Pines in such forest.
634-19 View of Small River in Mountainous Region, used fo Irrigation.
634-20 Deflecting Portion of Stream into Irrigating Ditch.
634-21 View of Irrigating Ditch along Mountain Side, ditch 1 miles long.

For Prices See Page 111

LANTERN SLIDES—Continued

HORTICULTURE

Continued

CARE OF TREES

634-31 Tree Badly Decayed at base.
634-32 Same Tree, cavity prepared for filling.
634-33 Same Tree, filled with cement, cut parts painted.
634-34 Smoothing and Calking a Wound made by wind storm.
634-35 View showing proper method of cutting a limb to prevent break and tear.
634-36 Properly Pruned Young Shade Trees.
634-37 The Result of Improper Pruning.
634-38 Methods of Tree Moving.

BUDDING AND GRAFTING

634-39 Method of Budding.
634-40 Methods of Budding.
634-41 Methods of Budding.
634-42 Methods of Grafting.
634-43 Methods of Grafting.
634-44 Methods of Grafting.

BARK OF TREES

Types for Identification Instruction

5816- 1 Bark of Hickory, shell or shag bark. (Carya alba).
5816- 2 Bark of Hackberry (Celtis occidentalis).
5816- 3 Bark of White Ash (Fraxinus americana).
5816- 4 Bark of Black Walnut (Juglans nigra).
5816- 5 Bark of Ironwood (Ostrya virginiana).
5815- 6 Bark of Scarlet Oak (Quercus coccinea).
5816- 7 Bark of Slippery Elm (Ulmus fulva).
5816- 8 Bark of White or American Elm (Ulmus americana).
5816- 9 Bark of White Oak (Quercus alba).
5816-10 Bark of Black Cherry (Prunus serotina).
5816-11 Bark of Pepperidge (Nyssa sylvatica).
5816-12 Bark of Basswood (Tilia americana).
5816-13 Bark of Poplar, immature.
5816-14 Bark of Poplar, mature.
5816-15 Bark of White Birch (Betula papyrifera).
5816-16 Bark of White Pine (Pinus strobus).
5816-17 Bark of Norway Pine (Pinus resinosa).
5816-18 Bark of Silver Maple (Acer saccharinum).
5816-19 Bark of Sugar Maple (Acer saccharum).
5816-20 Bark of Willow (Salix nigra).

BIRDS

Designed particularly to be used in connection with the study of the economic relations of the birds. Photographs made and set prepared by R. E. WAGER, Professor of Biology, Northern Illinois State Normal School. PRICE: Plain slides, each $0.50, net. Colored slides, each, $1.00, net.

CATBIRD

5986- 1 Catbird on Nest, brooding eggs.
5986- 6 Parent Bird on edge of nest with food in beak.
5986- 8 Three Nestlings the day they left the nest.
5986-46 Diagram showing Food of Catbird.
5987-30 Nest of Catbird. Four eggs.

BRONZED GRACKLE

5985-15 Parent Bird on nest.
5985-18 Parent Bird feeding young.
5987-18 Nest of Grackle. Five eggs.
5985-72 Diagram showing Food of the Grackle.

BLUE JAY

5985-21 Adult Bird on nest.
5985-22 Four Young Birds on branch. Day after leaving nest.
5987- 5 Nest of Blue Jay. Four eggs and one nestling.
5985-73 Diagram showing Food of Blue Jay.

MEADOW LARK

5985-26 Bird near nest with food in beak. Food largely made up of caterpillars.
5985-28 Adult near nest with large locust in beak.
5985-37 Adult feeding Young.
5985-41 Four Young Larks just outside of nest.
5987-17 Nest of Meadow Lark. Five eggs.
5987-14 Diagram showing Food of the Bird.

SONG SPARROW

5985- 5 Female at Nest. Young birds show.
5985- 9 Male at Nest. Canker worm in beak.
5985-12 Both Parent Birds at Nest.
5985-14 Two Nestlings at time of leaving the nest.
5987- 3 Nest of Song Sparrow. Five eggs.
5985-71 Diagram showing Food of the Bird.

CHIPPING SPARROW

5985- 1 Adult on Nest.
5985-75 Adult Feeding Young.
5985-76 Young Bird after leaving nest.
5987- 1 Nest of Chipping Sparrow. In pine tree.

BROWN THRESHER

5986- 9 Parent Bird on Nest.
5986-12 Parent Bird on Nest. Wings spread to protect young from sunlight.
5986-14 Parent Bird removing excrement from young.
5986-19 Three Young Threshers as they left the nest.
5986-47 Diagram showing Food eaten by Brown Thresher.
5987-10 Nest of Brown Thresher. Five eggs.

ROBIN

5986-23 Robin on Nest in pine tree.
5986-25 Robin Removing Excrement from young bird in nest.
5986-26 Nestlings, necks upstretched, nest in pine tree.
5986-29 Young Robin two days after leaving nest.
5986-48 Diagram showing Food consumed by Robin.
5987-13 Nest of Robin. Four eggs.

TRAILL FLYCATCHER

5985-52 Bird at Edge of Nest. Young cowbird in nest.
5985-55 Side View of Adult Bird. Young cowbird with neck upstretched.
5985-58 Adult Feeding Nestling Cowbird.

YELLOW WARBLER

5986-30 Yellow Warbler in Nest in Ninebark.
5986-34 Yellow Warbler on Edge of Nest.
5986-38 Two Young Birds on branch.
5987- 8 Nest of Yellow Warbler. Four Warbler and one Cowbird's egg.

RED-WINGED BLACKBIRD

5985-44 Female at Nest with food in beak.
5985-44 Female Feeding Young.
5985-49 Two Young as they left the nest.
5985-70 Diagram showing Food consumed by Redwing.
5987-11 Nest of Redwing in mustard. Four eggs.

ROSE-BREASTED GROSBEAK

5985-61 Male on Branch. Front view of bird.
5985-68 Male over nest. Young with necks upstretched.
5985-69 Male Feeding Young.
5987-29 Nest of Grosbeak. Three eggs, and one Cowbird's egg.
5985-77 Diagram showing Food of Grosbeak.

FLICKER

5984-10 Flicker at Hole, dorsal aspect of bird.
5984-11 Male Flicker at hole, side view.
5984-12 Male Flicker just coming out of hole.
5984-13 Female Bird, side view.
5984-14 Flicker Removing Excrement from hole.
5984-17 Diagram showing Food of the Birds.

RED-HEADED WOODPECKER

5984-15 Red-head with head partly in hole in telegraph pole.
5984-16 Red-head just emerging from hole.

BROWN CREEPER

5986-45 Brown Creeper on side of tree. Side view.

BLUEBIRD

5986-40 Bluebird just Entering Hole in telegraph pole.
5986-41 Female at Hole with food in beak.
5986-42 Male bird at Hole.
5986-43 One of the Birds just emerging from hole.

RED-TAILED HAWK

5984- 3 Head and Upper Body of Adult Bird. From life.

MOURNING DOVE

5984-47 Adult Bird at nest in which is one young.

CROW

5985-60 Well-grown Young Bird on stump.
5985-78 Diagram of Food of Crow.

For Prices See Page 111

LANTERN SLIDES FOR AGRICULTURE

IMPORTED

Orders cannot be accepted for less than 50 slides chosen from the following sets, Nos. 9985-9999.

9985. **Elementary Botany.** Copied from Pictures by permission of Messrs. Longmans & Company ..... Each, Net, Duty free $ 0.28

THE ROOT

1. Varied Forms Assumed by Root.
2. Its Endogenous Nature; its Cap and Hairs.
3. Development in a Mono- and a Dicotyledon.
4-5. Transverse sections of Ranunculus acris, showing the centripetal formation of wood.

THE STEM

6. Subterranean and Prone Forms.
7. Diagram of Dicotyledon.
8. Diagram of Monocotyledon.
9. Transverse Section of Dicotyledon.
10. Longitudinal Section of Dicotyledon.
11. Transverse Section of Monocotyledon.
12. Transverse Section of Dracaena, showing formation of new vascular bundles from extra fascicular cambium

THE LEAVES

13. Simple entire
14. Simple divided } Types of Leaves.
15. Compound
16. Particular Forms of Leaf.
17. Arrangement of Leaves on Stem.
18. Transverse Section through Stomata into Intercellular Spaces.
19. Aestivation.
20. Vernation.

THE FLOWER

21. Perfect, Pistillate, Staminate, and Neuter Flowers.
22. The Floral Diagram.
23. The Calyx, various forms of.
24. The Corolla, various forms of.
25. The Stamen, various forms of.
26. The Pollen, various forms of.
27. The Pistil, various forms of.

THE INFLORESCENCE

28. Definite.
29. Indefinite.

SUBSIDIARY ORGANS

30. Hairs, unicellular—multicellular.
31. Spines, prickles, phyllodes, phylloclades.

THE FRUIT

32. Indehiscent, and Diagram to Illustrate Dehiscent.
33. Dehiscent.
34. Development of Arillus of Yew.

THE SEED

35. Position of Ovule in Ovary and Embryo in Endosperm.
36. Comparison of Mono- and Dicotyledon.
37. Fertilisation of an Angiosperm.
38. Fertilisation of a Gymnosperm.

THE CELL AND VESSEL

39. Variety in Shape.
40-41. Thickening of Walls.
42. Special Marking on Cell Walls.
43. Its contents (A) Chlorophyll; circulation, rotation, occurrence in bands.
44. Its contents (B) Starch, Aleurone, in situ.
45. Its contents (C) Crystals.
46. Conjugation, Multiplication, and Free Cell Formation.
47. Sieve Tubes, Utricular and Laticiferous Vessels.
48. Cells, with contents of varying density.

THE TISSUES

49. Parenchyma, Prosenchyma, and Collenchyma.
50. Resin Passage.

9985A. Same as No. 9985, but colored ..... Each, Net, Duty free 1.25

9986. **Agricultural Botany.** Direct Photo-Micrographs ..... Each, Net, Duty free .28

ROOTS

1. Growing Tip of Root of Barley, long. sect.
2. Trans. Sect. Root of Maize, showing root hairs.
3. Trans. Sect. Root of Maize, showing branching.
4. Trans. Sect. Root, Enlarging Turnip.
5. Trans. Sect. Stem of Host, showing sucker roots of Dodder (Cuscuta trifolia).

STEMS

6. Trans. Sect. Stem of Oat.
7. Trans. Sect. Stem of Bean.
8. Long. Sect. Stem of Bean.
9. Long. Sect. Bud of Lime Tree.

LEAVES

10. Vert. Sect. Leaf of Bean.
11. Vert. Sect. Leaf of Oat.
12. Vert. Sect. Leaf of Cabbage, white.

FLOWERS

13. Trans. Sect. of an Anther.
14. Trans. Sect. of an Ovary of Potato.

FRUITS AND SEEDS

15. Vert. Sect. of a Grain of Oat, showing embryo and endosperm.
16. Trans. Sect. of Cotyledon of Pea.
17. Embryo of Oat, Trans. Sect.
18. Seed of Sweet Vernal Grass.

GENERAL STRUCTURE

19. Long. Sect. Stem Lettuce, to show milk tubes.
20. Sect. Stem Vegetable Marrow, to show sieve plates.
21. Epidermis of leaf of grass, to show stomata.
22. Stinging Hairs of Nettles.
23. Section of Potato, cells containing starch and cork cells of rind.

PUCCINIA GRAMINIS IN STAGES

24. Rust on Stem of Wheat.
25. Mildew on Stem of Wheat.
26. Barberry (Aecidium berberides).
27. Club Root in Turnips, showing enlargement of cells.
28. Ergot of Rye. Claviceps purpuria.
29. Smut of Wheat, Ustilago segetum.
30. Potato Disease, Fungus on Leaf, Peronospora infestans.

9987. **The Life of the Wheat Plant from Seed to Seed.** Photographed by special permission from a series of diagrams published by the Royal Agricultural Society of England ..... Each, Net, Duty free .28

1. The Structure of the Grain, I. 6 diagrams.
2. The Structure of the Grain, II. 2 diagrams.
3. Germination of the Grain, I. 6 diagrams.
4. Germination of the Grain, II. 4 diagrams.
5. The Young Plant, I. 5 diagrams.
6. The Young Plant, II. 4 diagrams.
7. Early Growth of the Ear, I. 5 diagrams.
8. Early Growth of the Ear, II. 4 diagrams.
9. Growth of the Ear and Flower, I. 4 diagrams.
10. Growth of the Ear and Flower, II. 3 diagrams.
11. Growth of the Ear and Flower, III. 6 diagrams.
12. The Flower, I. 6 diagrams.
13. The Flower, II. 10 diagrams.
14. Ripening of the Grain, I. 8 diagrams.
15. Ripening of the Grain, II. 7 diagrams.
16. The Wheat Straw, I. 2 diagrams.
17. The Wheat Straw, II. 5 diagrams.

9988. **The Life History of Wheat.** Direct Photo-Micrographs ..... Each, Net, Duty free .28

1. Wheat Plant Stem, Trans. Section, stained.
2. Wheat, Long. Section of one-half, stained.
3. Wheat Root, Trans. Section, stained.
4. Wheat Leaf, Trans. Section, stained.
5. Wheat, Silicious Cuticle, Section, stained.
6. Wheat Fruit, Long. Section of Embryo, stained.
7. Wheat Plant Fruit, Trans. Section of Endosperm, stained.
8. Wheat Plant Starch, Isolated.
9. Smut in Grain of Wheat, Ustilago segetum.
10. Mildew on Stem of Wheat, Puccinia graminis.
11. Spores of Bunt Fungus in Corn, Uredo foetida.
12. Wheat Stem Fly.
13. Eel Blight from Wheat, Vibrio tritici.
14. Meal Mites, Tyroglyphus farinae.

For Prices See Page 111

LANTERN SLIDES—Continued

9989. **Illustrations from the Results of the Rothamsted Experiments.** Published under the authority of the Lawe's Agricultural Trust. .....Each, Net, Duty free $ 0.28

Tables of results of experiments on the growth of Root-crops for many years in succession on the same land:

1. White Turnips, and Swedish Turnips, commencing 1843.
2. Sugar Beet, 5 years, 1871-5.
3. Mangel Wurzel, commencing 1876.
4. Table of results of Experiments on the growth of Barley for many years in succession on the same land, commencing 1852.

Tables of results of experiments on the growth of various Leguminous Crops, each for many years in succession on the same land, commencing 1847:

5. Produce of Beans, per acre per annum.
6. Nitrogen in the Produce of Beans, per acre per annum.
7. Produce of Red Clover (as Hay), on ordinary arable land.
8. Produce of Red Clover (Hay and Constituents), on rich garden-soil.
9. Table of results of Experiments on the Growth of Wheat for many years in succession on the same land, commencing 1843-4.

Tables of results of Experiments on Rotation of Crops; 45 years commencing 1848:

10. Swedish Turnips, produce per acre; 12 courses.
11. Barley, produce per acre; 11 courses.
12. Clover or Beans, produce per acre; 11 courses.
13. Wheat, produce per acre; 11 courses.
14. Average produce, and yield of Nitrogen per acre per annum; 8 courses.
15. Photographs of Roots (Swedish Turnips), grown in Rotation without Manure, with Mineral Manure, and with Mineral and Nitrogenous Manure.

Photographs of various Leguminous Plants, grown in Experiments on the Fixation of Free Nitrogen:

16. Peas, Vetches, and Yellow Lupins; grown in pots.
17. Peas, grown in pots.
18. Sainfoin; grown in pots.
19. Table of results relating to Nos. 17 and 18.

Tables of results of Experiments on the Growth of Potatoes for many years in succession on the same land, commencing 1876:

21. Manures, and Produce per acre (Sound and Diseased).
22. Specific Gravity, and Percentage Composition of Sound Tubers.

Tables of results of Experiments on the Mixed Herbage of Permanent Grass for many years in succession on the same land, commencing 1856:

23. Manures, and Produce (as Hay), per acre per annum.
24. Botanical Composition of the Herbage.
25. Summary of the Botanical Composition, per cent., per acre, etc.
26. Summary of the Chemical Composition of the Produce, per acre.
27. Table of results of Experiments on Wheat grown in alternation with Fallow, and Wheat grown year after year continuously, without Manure—42 years, 1850-1 to 1891-2.
28. Table showing the Home Produce, Import, Consumption, and Price, of Wheat, in the United Kingdom—40 Harvest-years, 1852-3 to 1891-2 inclusive.
29. List of the Rothamsted Field Experiments.
30. Plan of the Plots in Barnfield, on which the Experiments with Root-crops have been made.
31. Plan of the Plots in Hoosfield, on which Experiments have been made:
    (1) On Barley, commencing 1852.
    (2) On Leguminous Crops, commencing 1849.
    (3) On Alternate Wheat and Fallow, commencing 1851.
    (4) On Potatoes, commencing 1876.
32. Plan of the Plots in Broadbalk Field, on which Wheat has been grown for more than 50 years in succession, commencing 1843-4.
33. Plan of the Plots in Agdell Field, on which Experiments on Four-Course Rotation have been made, commencing 1848.
34. Plan of the Plots in the Park, on which Experiments have been made on the Mixed Herbage of Permanent Grass-land, commencing 1856.
35. Photographs and Plans of the Rothamsted Laboratory.
36. Photographs and Plan of the Rothamsted Sample House.
37. Colored Drawing and Description of the Rothamsted Rain gauges.
38. Colored Drawing and Description of the Rothamsted Drain gauges.
39. Table showing the Rainfall at Rothamsted, measured in a gauge one-thousandth of an acre in area—40 Harvest-years, 1852-3 to 1891-2.
40. Table showing the Rainfall; also the amount of Percolation through Drain-gauges, containing respectively, 20 inches, 40 inches, and 60 inches, depths of Unmanured, and uncropped Soil and Subsoil, in natural state of consolidation—22 Harvest-years, 1870-1 to 1891-2.
41. Table showing the loss of Nitrogen (as Nitrates), respectively through 20 inches, 40 inches, and 60 inches depth of Soil and Subsoil, also the loss of Nitrogen calculated as Nitrate of Soda—15 Harvest-years, 1877-8 to 1891-2.
42. Table showing the amounts of Nitrogen supplied in Manure, and estimated to be recovered in Increase of Crop, lost in Drainage, accumulated as Crop-residue in the surface-soil, and not so accounted for, in the case of differently matured Wheat plots—averages per acre per annum for 30 Harvest-years, 1851-2 to 1880-1.
43. Table illustrating the loss of Nitrogen as Nitrate, in a wet autumn and winter, in the drainage from the differently manured Wheat plots in Broadbalk-field; also the loss calculated as Nitrate of Soda; Season 1891-2, 49th year of the Wheat experiments.
44. Colored Diagrams illustrating the results of Experiments on the Feeding of Animals; showing the proportion of Nitrogenous, of Non-nitrogenous, and of Total Organic Substance consumed:—I. Per 100 lb. Live-weight per week. II. To Produce 100 lb. Increase in Live-Weight.

9989A. Same as No. 9989, but colored.....Each, Net, Duty free 1.40

9991. **Fruit Tree Cultivation**.....Each, Net, Duty free .35

1. Grafting; Stock, Graft, Graft cut, Graft inserted in Stock.
2. Budding; Stock, Bud cut for inserting, Bud inserted, Bud tied in.
3. Pruning a Pyramid Pear Tree.
4. Maiden Cherry, 1 year old.
5. Maiden Plum, 2 years old.
6. Maiden Pear Tree.
7. Pyramid Pear.
8. Pyramid Pear in Fruit in Pot.
9. Pyramid Pears "Conference" and "Pitmaster Duchess."
10. Bush Pear in Fruit.
11. Goblet-shaped Pear Tree in Fruit.
12. Diagonal Trained Pear in Fruit.
13. Horizontal Trained Pear Tree.
14. Fan Trained Plum.
15. Upright Trained Apple, 5 Branches.
16. Pyramid Apple Trees in Fruit in Pots.
17. Standard Apple, 3 years old.
18. Standard Pear, 3 years old.
19. Standard Plum, 3 years old.
20. Peach Trees, one year, pruned; and two years after pruning.
21. Pyramid Peach Grown in Pot, 20 years old, with 120 Peaches on it.
22. Half Standard Peach.
23. Bush Peach in Fruit.

9991A. Same as No. 9991, but colored.....Each, Net, Duty free 1.25

9993. **Nitrifying Organisms in Soils.** Photo-Micrographs.....Each, Net, Duty free .28

1. Nitrous organism in soil from Zurich (Zoogloea stage) × 1,000.
2. Nitrous organism in soil from Zurich (Zoogloea stage) × 1,000.
3. Nitrous organism in soil from Zurich (mobile stage) × 1,000.
4. Nitrous organism in soil from Java × 1,000.
5. Nitrous organism in soil from Java (mobile stage) × 1,000.
6. Nitrous organism in soil from Kazan, Russia, × 1,000.
7. Nitrous organism in soil from Gennevilliers (grown on jelly) × 1,000.
8. Nitrous organism in soil from Quito, Coccus, × 1,000.
9. Nitric organism in soil from Quito × 1,000.
10. Nitric organism in soil from St. Petersburg.
11. Nitric organism in soil from Bonn.

LANTERN SLIDES—Continued

9994. Effects of Manures. Made from a series of photographs of actual specimens grown with various manures, and mostly contain from four to eight samples on each slide. .....Each, Net, Duty free $ 0.28

1. Wheat. Experiment with and without Nitrogenous Manures.
2. Barley. Experiment with and without Nitrogenous Manures.
3. Peas. Experiment with and without Nitrogenous Manures.
4. Oats. Experiment with and without Nitrogenous Manures.
5. Oats. Experiments with Green Manures.
6. Peas and Oats. Experiments with and without Potash, Phosphoric Acid, and Nitrogen, for comparison.
7. Vetches. Experiments with and without Potash, Phosphoric Acid, and Nitrogen.
8. Peas and Wheat. Yield of Experiments with and without Various Manures.
9. Summer Rye. Experiments with and without Superphosphate, in autumn and spring.
10. Summer Rye. Experiments with and without Phosphate Powder, in autumn and spring.
11. Barley. Experiments with and without Superphosphate and Phosphate Powder.
12. Barley. Yield of experiments shown in Slide No. 11.
13. Barley. Manurial Experiments on Loamy Soil: (1) Without Phosphoric Acid; (2) with Phosphoric Acid as Superphosphate; (3) with Phosphoric Acid as finely pulverized Thomas' Phosphate.
14. Buckwheat and Peas. Experiments with Phosphoric Acid and Potash.
15. Oats. Green Manuring Experiments.
16. Oats. Yield of experiments with and without Green Manures.
17. Oats. Illustrating the Influence of Phosphatic Manuring on the Utilization of Nitrate Nitrogen.
18. Oats. Experiments with and without Phosphoric Acid in different forms.
19. Experiments with and without Superphosphate.
20. Crop of Oats. Yield of experiments with various manures on (1) Clay Soil; (2) Soil rich in Humus.
21. Crop of Oats and Barley. Yield of experiments with and without Phosphoric Acid on Clay Soil.
22. Vetches and Wheat. Yield of experiments with and without Potash, Phosphoric Acid, and Nitrogen.
23. Wheat. Experiments with (1) No manure (2) Potash and Phosphoric Acid; (3) Potash, Phosphoric Acid and Nitrogen.
24. Maize. Manurial Experiments with Phosphoric Acid, Potash, and in addition, Nitrogen as Nitrate of Soda.
25. Hemp. Manurial Experiments as in No. 24.
26. Tobacco. Manurial Experiments with Nitrogen and Superphosphate, and Nitrogen and Phosphate of Potash.
27. Beetroot. Manurial Experiments as in No. 24.
28. Carrots. Manurial Experiments as in No. 24.
29. Carrots, as above, showing roots.
30. Field Beans. Manurial Experiments as in No. 24.
31. Peas. Manurial Experiments as in No. 24.
32. Potatoes. Manurial Experiments as in No. 24.
33. Clover. Experiments with and without Phosphoric Acid in form of Superphosphate and Thomas' Phosphate Powder.
34. Fuchsias. Manurial Experiments in Hot-bed Soil.
35. Geraniums. Manurial Experiments in Hot-bed Soil.

9994A. Same as No. 9994, but colored.....Each, Net, Duty free **1.25**

9996. The Embryology of a Chicken. A unique Series of Lantern Slides from direct Negatives by Mr. W. M. Martin, of Redruth, comprising the complete history of the development of the germ from the time the egg is laid to the hatching of the chicken. .....Each, Net, Duty free .42

1. A Fresh Laid Egg.
2. A Fresh Laid Egg showing air space at broad end.
3. A Fresh Laid Egg carefully opened, showing circular germ which develops into the chicken.
4. Fresh Laid Egg opened and yolk turned upside down to show the twisted ends of membrane which keep the germ uppermost.
5. Appearance of Germ after 12 hours' incubation, concentric circles appearing.
6. Germ after 24 hours' incubation.
7. Appearance after two days.
8. Appearance on 3rd day.
9. Appearance on 4th day.
10. Showing effect of raising the temperature of incubator from 103 degrees (normal) to 120 degrees for 10 hours on 4th day.
11. 5th day.
12. A portion of No. 11 enlarged.
13. Embryo on 5th day dissected from the yolk.
14. Appearance on removing portion of shell on 5th day.
15. Embryo of No. 14 removed from shell and slightly magnified, showing rudimentary limbs.
16. 6th day.
17. Embryo of No. 16 dissected from the yolk and magnified.
18. 7th day.
19. Embryo of No. 18 removed from shell.
20. No. 19 enlarged.
21. Empty Shell on 7th day.
22. 8th day.
23. 9th day.
24. Entire Contents of Shell removed on 9th day.
25. 9th day—removed from shell, showing first formation of beak.
26. Showing the effect of temperature of 120 degrees on 9th day for several hours.
27. 10th day.
28. 11th day—portion of covering membrane removed.
29. 11th day—shell opened near broad end of egg, and covering membrane removed.
30. 11th day—removed from shell and covering membrane, showing growth of limbs and beak.
31. 11th day—contents of shell removed, yolk perforated and contents withdrawn.
32. 11th day—removed from shell and slightly enlarged, showing growth of beak and body.
33. 11th day—contents of shell removed and chicken placed in position to show two well-formed curves in main artery.
34. 11th day—showing well-expanded air space.
35. 12th day—showing appearance of membrane and blood vessels.
36. 12th day—covering membrane removed.
37. 12th day—removed from shell.
38. 12th day—entire contents of shell removed, showing white of egg being absorbed by yolk.
39. 13th day—appearance of covering membrane.
40. 13th day—with membrane removed.
41. 14th day—appearance on removing shell.
42. 14th day—removed from shell.
43. 15th day—appearance of covering membrane.
44. 15th day—covering membrane removed.
45. 15th day—removed from shell.
46. 16th day—membrane removed.
47. 16th day—opened from opposite side of shell.
48. 16th day—entire contents of shell removed.
49. 17th day—portion of membrane removed.
50. 17th day—membrane removed.
51. 17th day—entire contents of shell removed.
52. 17th day—showing chicken with swollen neck, head in wrong position, and dead.
53. Showing No. 52 from other side, with yolk removed.
54. 17th day—removed from shell.
55. 18th day—showing head of chicken almost in position for hatching.
56. 19th day—showing chicken in correct position for hatching.
57. 19th day—removed from shell.
58. 19th day—showing large amount of yolk still unabsorbed.
59. No. 58 removed from shell in its natural position.
60. 20th day—removed from shell.
61. 20th day—showing still unabsorbed yolk.
62. 20th day—shell opened opposite side from No. 61.
63. 21st day—shell carefully peeled off.
64. Showing position assumed by No. 63 on cutting the binding cords.
65. 21st day—removed from shell.
66. End of air space opened on 21st day.
67. Coming through the shell.
68. Five hours later.
69. A snap shot one hour later.
70. Chicken twelve hours after hatching.

LANTERN SLIDES—Continued

9998. Veterinary Science..... .....Each, Net, Duty free $ 0.2(

VETERINARY ANATOMY

1. Skeleton of Horse.
2. Skeleton of Cow.
3. Skeleton of Sheep.
4. Skeleton of Dog.
5. Skeleton of Pig.
6. Lateral View of Horse's Skull.
7. Right Fore-foot of Horse.
8. Left Hind-foot of Horse, External Aspect.
9. External Muscles of Right Anterior Limb of Horse.
10. Larynx of Horse.
11. Bronchial Tubes of Horse.
12. Kidneys of Ox.
13. Heart and Principal Vessels of Horse; Left Face.
14. Heart and Principal Vessels of Horse; Right Face.
15. Stomach of Horse.
16. Stomach of Ox.
17. Intestines of Horse, General View.
18. Roots of Jugular Vein in Horse.
19. Median and Vertical Section of Horse's Brain.
20. Nerves of Digit.

BACTERIOLOGY

21. Healthy Blood. Red and White Corpuscles.
22. Involution Form of Bacillus anthracis (Agar Cultivation).
23. Spore-formation of Bacillus anthracis (Potato Culture).
24. Bacillus of Tetanus (Culture).
25. Tuberculosis (Intestinal Ulcers in a Tubercular Cow).
26. Tuberculosis. (Lungs of Rabbit inoculated with Milk from a Tubercular Cow).
27. Actinomyces.
28. Actinomycosis ("Lumpy Jaw").
29. A Specimen of the Glanders Bacillus.

PARASITES

30. Spiroptera and Larvae of Oestrus in Stomach of Horse.
31. Larvae and Pupa of Gastropbilus equi.
32. Male and Female of Gastrophilus equi.
33. Taenia perfoliata of Horse; Cephalic extremity of Taenia perfoliata.
34. Taenia mamillana; Cephalic extremity of same. Taenia plicata of Horse.
35. Taenia expansa of Ox; Cephalic extremity.
36. Tacnia marginata of Dog, and Hooks of same.
37. Taenia coenurus of Dog, and Hooks of same.
38. Taenia echinococcus and Hooks of same.
39. Ascaris lumbricoides; Lateral View and Ventral Surface, Male and Female.
40. Oxyuris curvula of Horse, Male and Female.
41. Fragments of the Coecum of Horse, showing Tumors due to Sclerostones and Parasites.
42. Cephalic Extremity of Strongylus contortus of Sheep. Caudal Extremity of the Male Phagostoma venulosum.
43. Trichina spirales of Pig.

EXTERNAL PARASITES OR ECTOZOA

44. Haematopinus macrocephalus of Horse (Female).
45. Haematopinus eurysternus of Ox (Female).
    Haematopinus tenuirostris of Ox (Female).
    Trichodectes scalaris of Ox (Female).
46. Trichodectes sphoerocephalus of Sheep (Female). Melophagus of Sheep.
47. Ixodes ricinus of Dog.
48. Psoroptes Communis equi, Male.
49. The Mange Acarus of Sheep.
50. Dog, affected with advanced Demodecic Scabies.

OBSTETRICS

51. Vertebro-sacral Position of Foetus (Cow).
52. Anterior Presentation: Fore limb crossed over the neck.
53. Anterior Presentation: One fore limb completely retained.
54. Anterior Presentation: Fore limbs bent at the knees.
55. Anterior Presentation: Both fore limbs completely retained.
56. Anterior Presentation: Extreme downward deviation of the head.
57. Anterior Presentation: Lateral deviation of the head towards the shoulder.
58. Anterior Presentation: Lateral deviation of the head towards the abdomen.
59. Anterior Presentation: Deviation of the head upwards and backwards.
60. Lumbo-sacral Position.
61. Hock Presentation: Hock corded.
62. Thigh and Croup Presentation.
63. Sterno-abdominal Presentation, Head Retained: Calf.
64. Baron's Obstetric Machine.

VETERINARY SURGERY

65. Post Travis.
66. Casting—Rope applied.
67. English Method of throwing down a horse with hobbles.
68. Operating Table: Vertical Position.
69. (1) Alsace Nose-ring and Head-stall.
    (2) Alsace Nose-ring applied.
    (3) Vignau's Controlling Apparatus for Oxen.
70. Securing hind leg by means of tail; Ox Travis.
71. (1) Single Pin Suture; (2) Quilled Suture; (3) Dosalled Suture; (4) Zigzag Suture.
72. Horse in Slings.
73. (1) Apparatus for Fractured Scapula.
    (2) Apparatus Applied to the Shoulder.
    (3) Iron Splint for Fracture of Bones of the Fore Limb.
    (4) Iron Splint Applied.
74. The Various Arrangements of Cautery Lines.
75. (1) Inside of Hock with Cunean Tendon exposed.
    (2) Same raised for division.

9999. Diseases and Parasites of Cattle.....Each, Net, Duty free .28

1. Warbles in Ox, Hypoderma bovis, female, Larva from tumor, Genital Apparatus, Eggs, etc.
2. Bot in the Horse, Gastrophilus equi. Bots attached to stomach, eggs on hairs, and adult fly.
3. Mange in the Horse, Psoroptes cummunis equi, Male.
4. Mange in the Horse, Male and Female.
5. Mange in the Dog, Demodex folliculorum.
6. Itch in Man, Sarcoptes scabei, Male and Female.
7. Scab in Sheep, Psoroptes longirostris var. ovis.
8. Lice of Pig.
9. Lice of Horse.
10. Lice (sucking) of Ox, Haematopinus curysternus.
11. Lice (biting). Trichodectes scalaris, with allied form from Magpie for comparison.
12. Tick from Sheep, Ixodes ricinus.
13. Tick from Dog, Ixodes ricinus.
14. Tick or Ked from Sheep, Melophagus ovioous.
15. Brain of Sheep with Polycephalous Hydatid of Taenia caenurus.
16. Tape Worm of Dog, Taenia marginata, in Bladder Cyst from Sheep.
17. Tape Worm of Dog, Taenia marginata.
18. Tricbina spiralis, a piece of infested flesh.
19. Liver Fluke of Sheep, Distomum haepaticum.
20. The Snail the Fluke inhabits, Limnaea truncatula and embryo of D. haepaticum.
21. Autumn Breeze Fly, Tabanus bovis, magnified head and mouth organs.
22. Common Symbiot, Symbiotes communis, found on Horse, Ox, Goat, Sheep, and Rabbit.

GENERAL APPARATUS AND SUPPLIES

ARRANGED ALPHABETICALLY

FOR

CHEMICAL APPARATUS AND GLASSWARE

NOT FOUND IN THIS LIST

SEE

CATALOG M

IN WHICH

OUR COMPLETE LINE OF SUCH SUPPLIES

IS LISTED

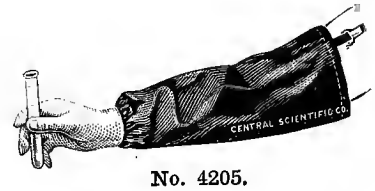
FOR

CHEMICALS

SEE

CATALOG R

Nos. 4201-3.



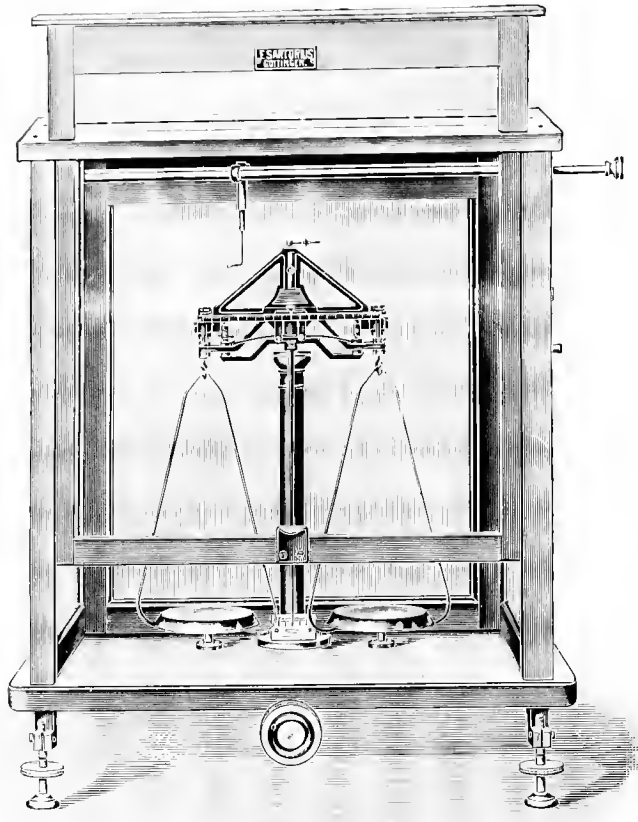
No. 4205.

4201. **APRON**, for laboratory use; protects the clothes from dirt and acid. Heavy-weight rubber, with drill cloth backing; width, 36 inches; length, 50 inches..... $ 0.80

4203. **APRON**, light weight, with muslin cloth backing; width, 36 inches; length, 50 inches.. .67

N. B.—If the above aprons are too long they can easily be cut off to the required length.

4205. **OVER-SLEEVES**, rubber acid-proof cloth. Per pair..... .40



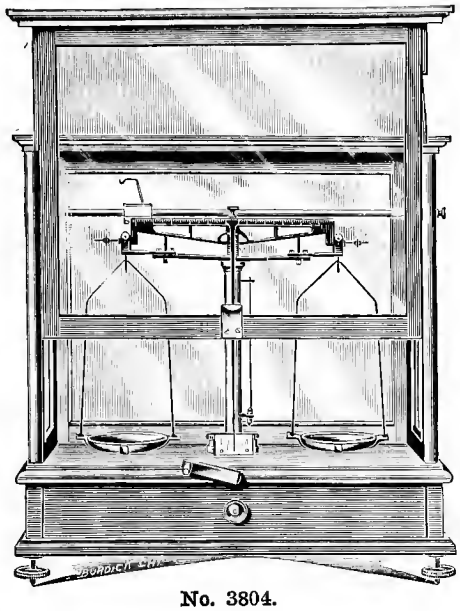
No. 3802.

3802. **BALANCE, Sartorius' Analytical, New Model, "America,"** especially designed for American educational institutions. The compensating hangers are made in one piece, which prevents their falling apart, and being suspended on three points, they allow for uneven balancing. Short beam of magnalium metal, rider arrangement, agate knife edges and planes, nickel plated pans, mounted on black glass plate, provided with leveling screws. Length of beam, 14 centimeters; capacity, 200 grams; sensibility with full load, .1 milligram.....Duty Free $ 38.50

3802A. **BALANCE, Sartorius' "America,"** furnished from stock..... 55.50

3802K-Q. **BALANCES,** see page 191.

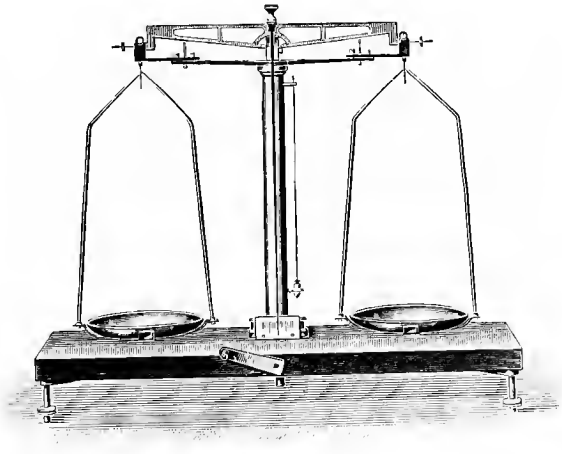
For full line of General Apparatus and Supplies see Catalog M.



No. 3804.

3804. **BALANCE, Chemical,** open beam, agate knife edges and planes, arrests for the hangers, beam support, plumb bob and leveling screws, hangers fitted with double hooks for specific gravity experiments. Mounted in mahogany case with glass sides and top and fitted with sliding front and drawer. Length of beam, 21 centimeters; diameter of pans, 8 centimeters; capacity, 100 grams; sensibility, 2 milligrams...Duty Free $ 22.50

3804A. **BALANCE, Chemical,** same as No. 3804, furnished from stock..... 33.35

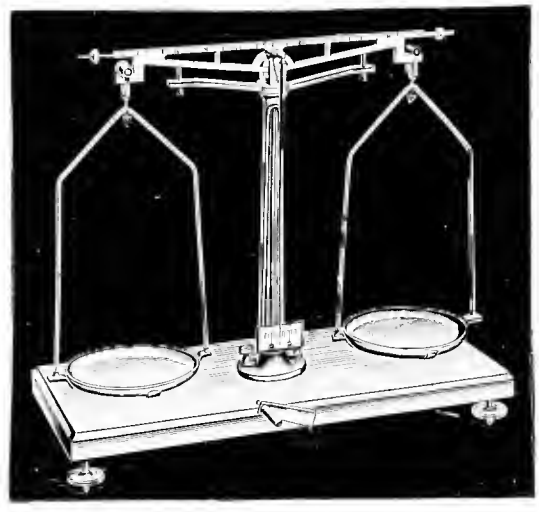


No. 3806.

3806. **BALANCE, Chemical,** same as No. 3804, mounted on polished mahogany board, fitted with leveling screws.....Duty Free 11.00

3806A. **BALANCE, Chemical,** same as No. 3806, furnished from stock..... 16.00

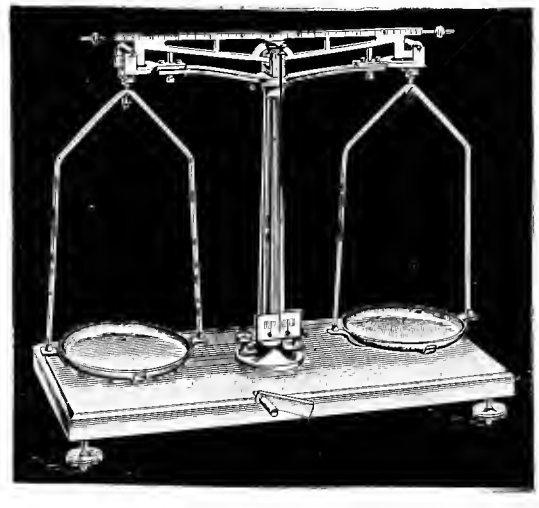
For full line of General Apparatus and Supplies see Catalog M.



No. 3808.

3808. **BALANCE, "Cenco" Precision,** made entirely of **Magnalium,** to resist all laboratory fumes. Light and durable, with adjustable beam support, plummet, leveling screws and agate knife edges and planes. Mounted on **Magnalium** board.

Capacity, grams	100	250
Sensitive to, milligrams	3	5
Furnished from stock	$15.00	17.50
3808A. **BALANCE, "Cenco" Precision,** same as No. 3808. Duty Free	10.00	11.00

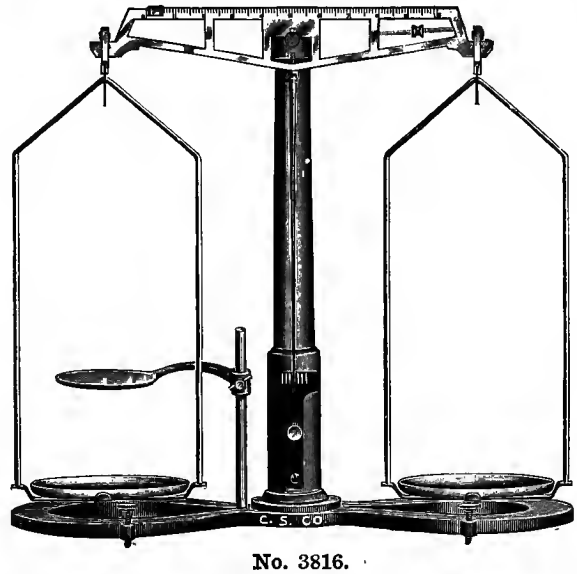


No. 3808B.

3808B. **BALANCE, "Cenco" Precision,** same as No. 3808, but with arrest for hangers.

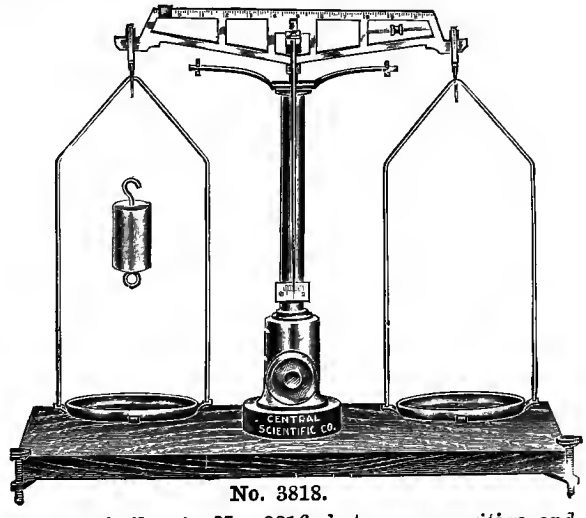
Capacity, grams	100	250
Sensitive to, milligrams	1	2
Duty Free	11.00	12.50

For full line of General Apparatus and Sup plies see Catalog M.



No. 3816.

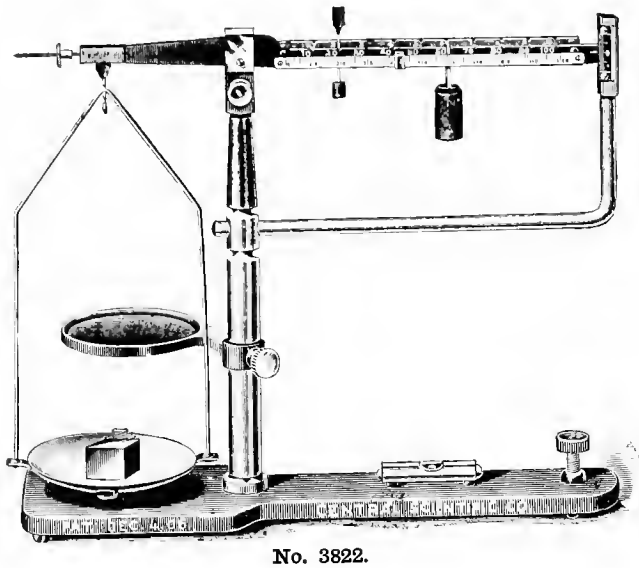
3816. **BALANCE, Laboratory,** more sensitive and convenient than the Harvard Trip Scale. **Capacity,** 2 kilos. **Sensibility,** 0.05 grams or less.
Beam, open construction. No small weights. A rider indicates all amounts up to 10 grams by 1/10 gram divisions.
Damping Device, positive in action, brings balance quickly to rest.
Bearings, high grade steel prisms, carefully polished and adjusted.
Hangers of new design, eliminating friction and wear.
Leveling Screws are supplied, insuring greater sensitiveness.
Plumb Bob, not shown in illustration, makes accurate leveling a simple matter.
Adjusting Screw protected within open work of beam.
Dimensions. Length of beam between knife edges, 32 cm.; graduated part, 25.4 cm.
Pans, 14 cm. in diameter. Height of balance, 45 cm.
An Adjustable Shelf for specific gravity work included ..... $ 12.75



No. 3818.

3818. **BALANCE, Laboratory,** similar to No. 3816, but more sensitive and of better finish and construction. Mounted on polished mahogany finish base provided with leveling screws. An eccentric movement operated by knurled head raises beam from beam arrest. Provided with counterpoise. Made of brass finely finished. Plumb bob and protected adjusting screw as in No. 3816.
Height of balance, 48 cm.; diameter of pans, 14 cm.; length of beam (between knife edges), 32 cm.
Capacity 2,000 grams. Sensibility with full load 30 milligrams or less, which is increased with smaller loads..... 22.00

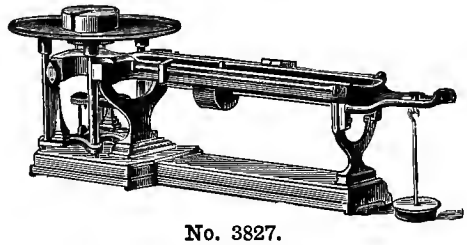
For full line of General Apparatus and Supplies see Catalog M.



No. 3822.

3822. **BALANCE, "Cenco" Triple Beam,** for physical and chemical laboratories. The three beams are placed in the same horizontal plane, thus conforming to scientific principles involved, which is not true of other styles of triple beam balances. Weighings are obtained by movement of the riders along the beams. These riders are easily handled and quickly placed in the notches, but cannot be removed from the beams. An adjustable support is provided for a jar or other receptacle for experiments in specific gravity. Provided with stable base neatly japanned, and with sensitive spirit level and leveling screws. Balance neatly finished in nickel plate and japan. Capacity of middle beam, 100 grams by 10 gram divisions; back beam, 10 grams by 1 gram divisions; front beam, 100 centigrams by 1 centigram divisions. Total capacity, 111 grams; sensibility, with or without full load, guaranteed to 1 centigram. Actual tests, however, give a sensibility of from 4 to 8 milligrams. Features easily recognized are: Rapid weighing, constant sensibility, accuracy, freedom from loss of weights, no interference or breaking of weights..... $ 14.00

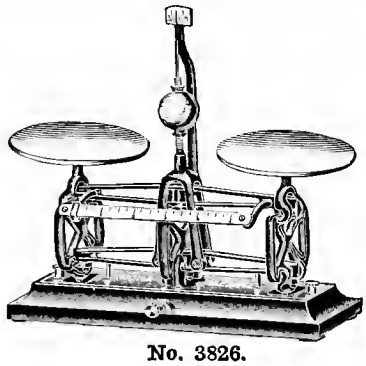
3822A. **EXTRA WEIGHT,** for use with No. 3822, for weighing over 111 grams, but not to exceed 201 grams. Weight is placed on the 100 gram notch of the middle beam. Sold only at the same time with No. 3822..... 1.65



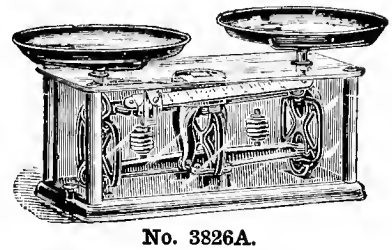
No. 3827.

3827. **BALANCE, Solution or Soil,** provided with two weighing beams and sliding poises. One beam is divided into one hundred parts, each part representing one gram; the other beam is divided into ten parts, each part representing one hundred grams. A bar with sliding poise is placed under the weighing beams for the purpose of balancing the empty bottle or container, which is quickly done by sliding the poise along the bar until a correct balance is secured. This balance will be found indispensable in soil study where quantities up to 20 kilos need to be weighed with accuracy.....Net 25.00

For full line of General Apparatus and Supplies see Catalog M.



No. 3826.

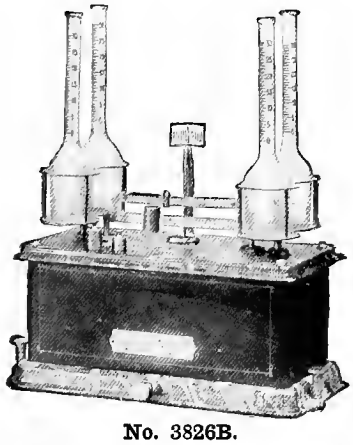


No. 3826A.

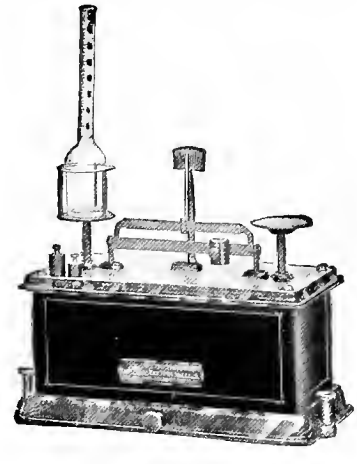
3826. **BALANCE, Torsion.** A laboratory scale of the most useful type. No knife edges, but built on the torsion principle. This scale is used extensively for analysis in soil laboratories and has been designed according to suggestions of the United States Department of Agriculture. High poise indicator and arrest. Slide beam reading to 10 grams by 1/10th gram divisions. Porcelain plates 6 inches in diameter. Height, 12½ inches; depth, 6½ in.; length, 15 in. over all. Capacity, 1 kilo. Sensibility, 7 centigrams. Net $ 18.00

3826A. **BALANCE, Torsion,** in glass case, with German silver corner posts and nickel-plated base. Slide beam inside glass case reading to 100 grams by 1 gram, and controlled from outside. Nickel-plated brass pans 9 inches in diameter. Height, 10 inches; depth, 9¼ in.; length, 20¼ in. over all. Capacity, 4.5 kilos. Sensibility, ⅕ gram. Net 35.00

3826AA. **BALANCE, Torsion,** similar to No. 3826A Balance, but much more sensitive, having high poise, and therefore especially recommended for laboratory use. Slide beam inside glass case reading to 100 grams by 1 gram divisions. Nickel-plated brass pans, 8 inches in diameter. Height, 12 inches; depth, 8 inches; length, 19½ inches over all. Capacity, 4.5 kilos. Sensibility, 1/15 gram..... Net 40.00



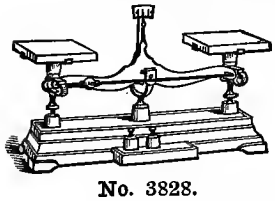
No. 3826B.



No. 3826BB.

3826B. **BALANCE, Torsion Cream Test,** sensitive to 1 centigram; has sliding tare poise to counterbalance bottles, special bottle holders, high index and arrest. For four bottles. Height, 8 inches; depth, 5½ inches; length, 10½ inches over all. With 9 and 18 gram weights..... Net 16.00

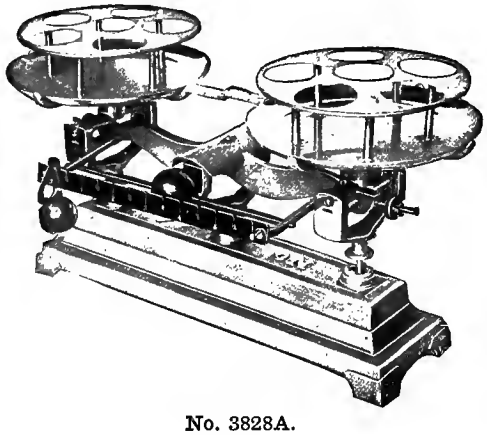
3826BB. **BALANCE, Torsion Cream Test,** same as No. 3826B, but for one bottle. The one bottle size gives more accurate results than are possible when several bottles are weighed at once. With 9 and 18 gram weights..... Net 14.00



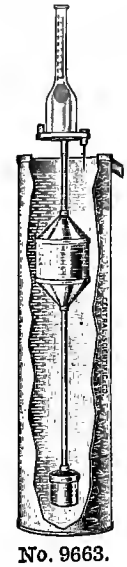
No. 3828.

3828. **BALANCE, Cream Test,** for use in connection with Babcock Test. Especially designed for very accurate weighing of cream. Metal parts galvanized to make them rustproof, porcelain plates and agate bearings. The bar in front of the balance is used for balancing bottle and is provided with the necessary weight. This scale is compact, being but 10½ inches long and being of careful construction is accurate..... Net 10.00

For full line of General Apparatus and Supplies see Catalog M.



No. 3828A.



No. 9663.

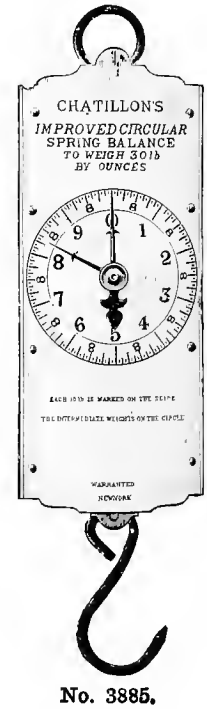
3828A. **BALANCE, Cream Test.** This scale is designed to weigh 12 bottles at one time. On both sides of the scale there is a bottle rack holding six bottles each. The scale has a beam on the front divided into 12 parts, each part representing 9 grams; the divisions marked with whole numbers each representing 18 grams. Back of this beam is a tare beam with sliding brass weight, to balance bottles as placed in the rack; this does away entirely with the use of weights. The scale has agate bearings and is entirely galvanized to make it rust proof.....Net $ 12.00

9663. **CREAM BALANCE, Wisconsin Hydrostatic.** This balance has been devised to meet the demand for a simple and correct method of weighing cream into test bottles and consists of a specially devised brass float, which is placed in a cylinder of water. Very accurate weighings can be made with this instrument and as there are no bearings to rust it will retain its sensitiveness indefinitely. Complete with metal cylinder, float, and 9-gram weight, but without bottle.....Net $ 3.50

3885. **BALANCE, Decimal Milk.** This Spring Scale is intended especially for use in connection with the Babcock Test for keeping records of the quantity of milk from individual cows, together with the per cent. fat, so as to calculate the butter yield. The scale is provided with a loose pointer, which, by means of a thumb-screw, may be set anywhere on the dial to offset the weight of the milk pail so this does not have to be deducted from the reading. The reading being in pounds and decimals of pounds makes the calculation very much simpler than when pounds and ounces are given as on the ordinary scale. (Decimal divisions not shown in the illustration.) Capacity, 30 pounds, weighing by 1/20 pounds. Each..... 4.00

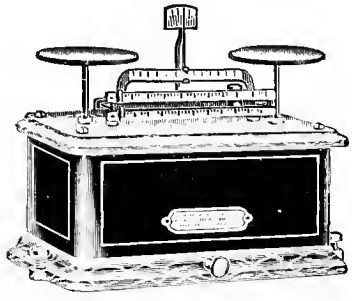
3886. **BALANCE, Decimal Milk.** Same as No. 3885, but capacity 60 pounds, weighing by 1/10 pounds. Each..... 5.00

3888. **CHARTS, Milk Record,** for one week's record of 15 cows, with spaces for both morning and afternoon production, in pounds and tenths. Per hundred..... 1.00

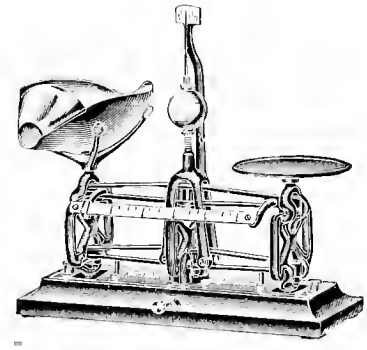


No. 3885.

For full line of General Apparatus and Supplies see Catalog M.



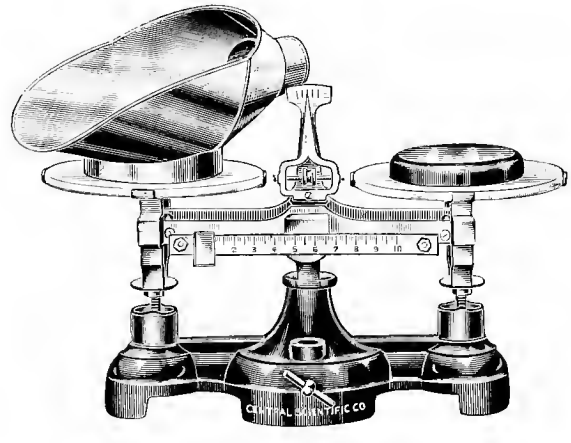
No. 3826C.



No. 3826D.

3826C. **BALANCE, Torsion Moisture Test,** for determining amount of moisture in butter. This scale is constructed with percentage beams so that 0.1 per cent to 30 per cent of moisture can be determined without calculation when 10 gram samples of butter are used. By means of two tare beams one or more dishes can be balanced and recorded. Height, 8 inches; depth, 5½ inches; length, 10½ inches over all. With 10 gram weight.....Net $ 15.00

3826D. **BALANCE, Torsion Grain and Seed Test,** designed expressly for the determination of moisture in grain. (See Bulletin No. 99, Bureau of Plant Industry.) Has high poise, indicator, arrest and seamless brass scoop. Capacity, 1 kilo. Sensitive to 7 centigrams. Slide beam reads to 10 grams by 1/10 gram. With block of special weights, 100 grams to 5 grams.....Net 17.50

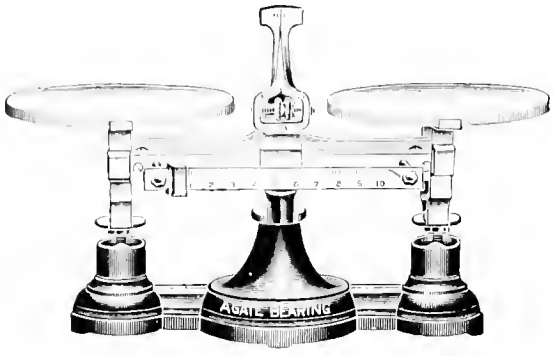


No. 3830B.

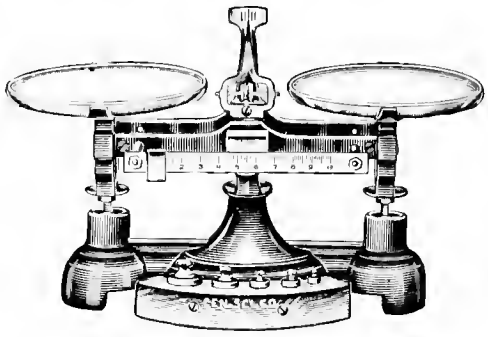
3230B. **BALANCE, Grain Test.** Consists of No. 3830 "Cenco" Agate Bearing Trip Scale (for description see next page) with the addition of a funnel scoop and counterpoise, accurately adjusted 8.0

3830A. **FUNNEL SCOOP AND COUNTERPOISE,** only, of No. 3830B..... 2.0

For full line of General Apparatus and Supplies see Catalog M.



No. 3830.

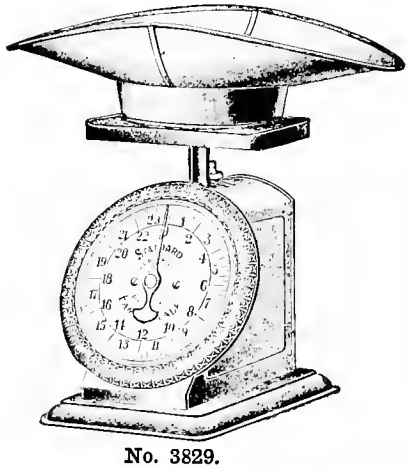


No. 3832.

3830. **"CENCO" TRIP SCALE, Agate Bearing,** Harvard design. In this trip scale we have done away with the rough cast and forged iron parts used for years in the Harvard Trip Scale, and employ parts of brass and steel neatly formed by elaborate tools and machinery. This makes possible a degree of perfection never before attained in assembling this style of balance.

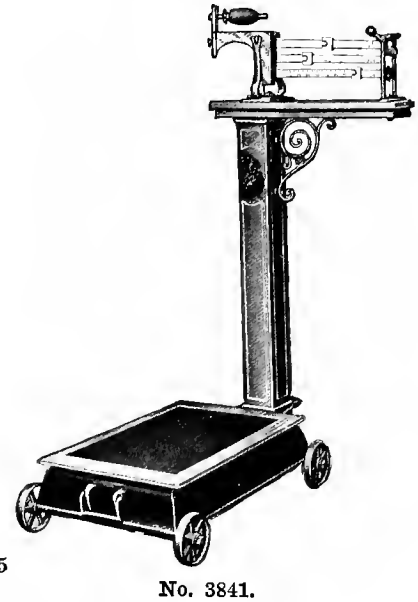
The BEARINGS consist of HARDENED STEEL PRISMS resting on SIX AGATE SHELVES of large dimensions. This construction adds very materially both to the initial sensibility of the scale and to its ability to retain its sensibility after long continued use. The graduated beam has a range of 10 grams in 1/10 gram divisions. The capacity of the scale is 2,000 grams. Sensibility is guaranteed to be 1/10 gram. Actual tests show a much greater sensibility ..... $ 6.65

3832. **SCALE, Dispensing and Solution,** with AGATE BEARINGS as described under No. 3830. This balance will be found ideal for laboratory and pharmaceutical work. The pans are of non-rusting metal, and 14 cm. in diameter. The graduated beam has a range of 10 g. in 1/10 g. divisions and brass weights from 10 g. to 100 g. are supplied, conveniently fitted into a projecting holder. Capacity, 2,000 g. Sensibility is guaranteed to be 1/10 g.; actual tests show a much greater sensibility..... 8.00



No. 3829.

3829. **SCALE, Standard Family,** slanting white enameled dial, weighs 24 pounds by 1 ounce divisions; with square sheet steel platform and tin scoop. 1.65

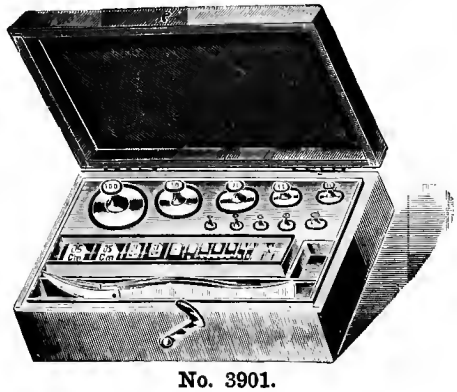


No. 3841.

3841. **SCALE, Platform,** with patent combination beam. Capacity 500 pounds by ½ pound divisions; also graduated to 175 kilos by 100 gram divisions. No loose weights, as full capacity is on the beam. With wheels....Net 35.00

3841A. **SCALE, Platform,** same as No. 3841, but without wheels.....Net 30.00

For full line of General Apparatus and Supplies see Catalog M.



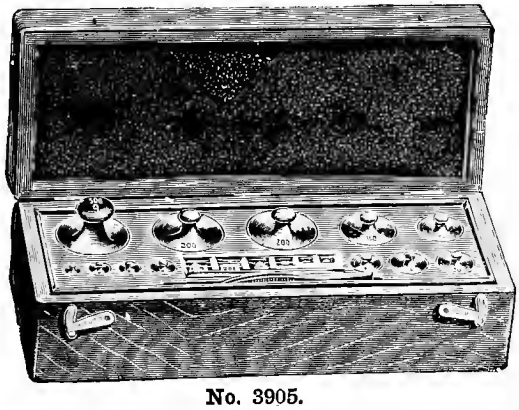
No. 3901.

3901. **WEIGHTS, Precision (Sartorius). Gold plated.** Brass weights, heavily plated with gold; fractional weights of platinum except the 5, 2 and 1 mg., which are of aluminum, two platinum riders. Put up in velvet lined mahogany case, with ivory tipped forceps. 1 milligram to 100 grams.....Duty Free $ 9.00

3902. **WEIGHTS, Precision (Sartorius).** Same as No. 3901, but furnished from stock...Net 16.00

3903. **WEIGHTS, Precision (Sartorius).** Same as No. 3901, but 1 milligram to 50 grams. .....Duty Free 8.00

3904. **WEIGHTS, Precision (Sartorius).** Same as No. 3903, but furnished from stock...Net 14.00



No. 3905.

3905. **WEIGHTS, Good Grade.** Brass weights, with fractional weights of German silver (except the 5, 2 and 1 mg. weights, which are of aluminum). In fine mahogany box with brass forceps.

1 milligram to.....	20 g.	50 g.	100 g.	200 g.	500 g.	1000 g.
Each	3.00	3.35	4.00	5.55	7.25	10.00

No. 3907.

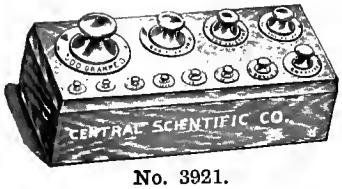
3907. **WEIGHTS, Good Grade.** Same as No. 3905, but in a polished hardwood block instead of a box. With brass forceps.

1 milligram to.....	20 g.	50 g.	100 g.	200 g.	500 g.	1000 g.
Each	1.55	1.77	2.25	3.35	4.75	7.00

3909. **WEIGHTS.** Separate weights for No. 3905 or No. 3907.

Grams	1	2	5	10	20	50	100
Each	.06	.06	.06	.09	.11	.22	.40

For full line of General Apparatus and Supplies see Catalog M.



No. 3921.

No. 3929.

No. 3933.

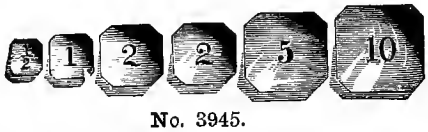
3915. **WEIGHTS, Brass,** in block, 1 centigram to 20 grams..... $ 0.45
3917. **WEIGHTS, Brass,** in block, 1 centigram to 50 grams..... .60
3919. **WEIGHTS, Brass,** in block, 1 centigram to 100 grams..... .78
3921. **WEIGHTS, Brass,** in block, 1 gram to 500 grams..... 1.77
3923. **WEIGHTS, Brass,** in block, 1 gram to 1,000 grams..... 3.00
3925. **WEIGHTS, Brass,** single weights, same style as in above sets.

Grams	1	2	5	10	20	50	100	200	500	1,000
Each	$0.06	.06	.06	.09	.11	.17	.25	.45	.80	1.25

3927. **WEIGHTS, Brass,** in block, ¼ oz. to 1 lb..... 3.00
3929. **WEIGHTS, Brass,** in block, ¼ oz to 2 lbs..... 4.25
3933. **WEIGHTS, Iron,** in nest, 5 grams to 1 kilo (duplicates of 20 and 200 grams)..... 1.20
3934. **WEIGHTS, Iron,** in nest, 5 grams to 2 kilos (duplicates of 20 and 200 grams)..... 1.95
3935. **WEIGHTS, Iron,** in nest, 5 grams to 5 kilos (duplicates of 20, 200 and 2,000 grams).... 4.20
3937. **WEIGHTS, Iron,** single weights, same style as Nos. 3933-3935.

Kilos	1	2	5
Each	.55	.75	1.50

3938. **WEIGHTS, Iron,** in nest, ½ oz. to 1 lb..... 1.25



No. 3945.

No. 3947.

3945. **WEIGHTS, Aluminum,** square, made concave so they can be picked up readily, ½ grain to 10 grains, in pasteboard box..... .50
3947. **WEIGHTS, Aluminum,** ½ grain to 5 grains, in pasteboard box..... .25

No. 3950.

Nos. 3951-3957.

No. 3959.

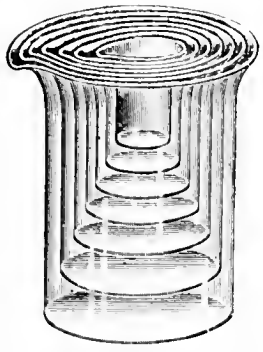
3950. **WEIGHTS, German Silver,** 1 milligram to 500 milligrams, in box with sliding cover; each weight in a separate compartment; with brass forceps..... 1.33
3951. **WEIGHTS, German Silver,** fractional parts of a gram, put up in sets, 1 milligram to 500 milligrams, with duplicates of the 2, 20 and 200 milligram pieces, 12 in all, in pasteboard box..... .22
3953. **WEIGHTS, German Silver,** fractional parts of a gram, same as No. 3951; 1, 2, 5, 10, 20, 50, 100, 200, 500 milligrams. Each..... .05
3955. **WEIGHTS, Platinum** (1, 2 and 5 milligrams aluminum), fractional parts of a gram, put up in sets, 1 milligram to 500 milligrams, with duplicates of the 2, 20 and 200 milligram pieces, 12 in all, in pasteboard box..... 5.00
3957. **WEIGHTS, Platinum** (1, 2 and 5 milligrams aluminum), same as No. 3955.

Milligrams	1	2	5	10	20	50	100	200	500
Each	.20	.20	.22	.30	.33	.45	.60	.85	1.50

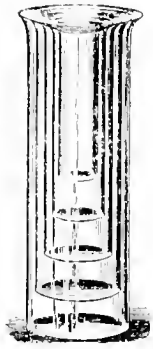
3959. **RIDERS, Platinum.**

Milligrams	1	2	5	6	10	12
Each	.40	.40	.30	.25	.25	.25

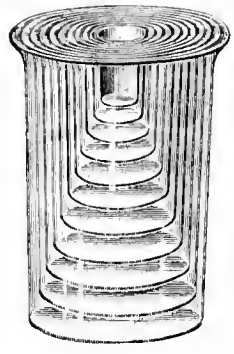
For full line of General Apparatus and Supplies see Catalog M.



No. 4215.



No. 4225.



No. 4233.

4215. **BEAKERS, Griffin Form,** lipped; of best Bohemian glass.

No.	000	00	0	1	2	3	4	5	6	7	8
Capacity, c.c.	30	50	75	130	230	350	550	750	1000	1400	1800
Each	$0.06	.08	.09	.10	.15	.20	.25	.33	.41	.50	.60

BEAKERS, same as No. 4215, nested:

4216. Nos. 000-0; 3 in nest. Per nest ..... $ 0.23

4217. Nos. 0-2; 3 in nest. Per nest ..... .34

4218. Nos. 1-4; 4 in nest. Per nest ..... .70

4219. Nos. 0-4; 5 in nest. Per nest ..... .79

4220. Nos. 0-5; 6 in nest. Per nest 1.12

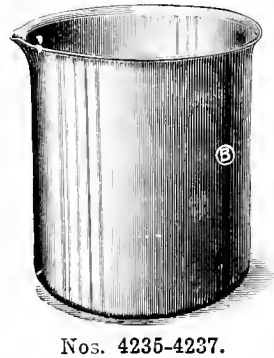
4221. Nos. 0-7; 8 in nest. Per nest 2.03

4225. **BEAKERS, Extra Tall Form,** without lip; of best Bohemian glass.

No.	1	2	3	4
Capacity, c.c.	100	180	270	400
Each	.10	.14	.17	.25

4233. **BEAKERS, Usual Form,** without lip; of best Bohemian glass.

No.	000	00	0	1	2	3	4
Capacity, c.c.	25	45	70	100	180	270	400
Each	.06	.06	.07	.09	.10	.15	.21



Nos. 4235-4237.

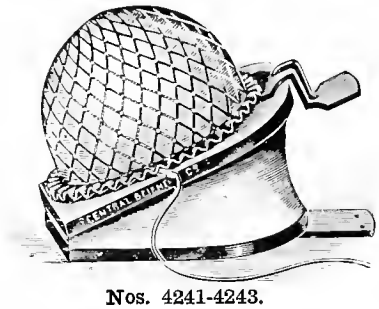
4235. **BEAKERS, Copper,** Griffin form, with lip.

Capacity, ounces	4	8	16	32
Each	.55	.67	.88	1.25

4237. **BEAKERS, Aluminum,** Griffin form, with lip.

Capacity, ounces	4	8	16	32
Each	.50	.67	1.00	1.50

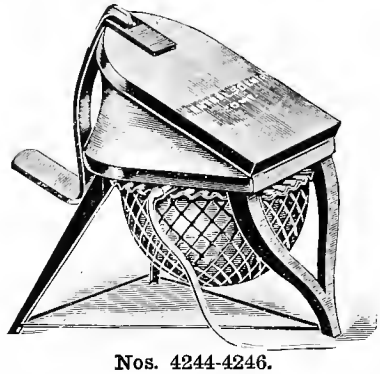
For full line of General Apparatus and Supplies see Catalog M.



Nos. 4241-4243.

BELLOWS, for blast lamps, blow-pipes, etc.

Catalog No.	4241	4242	4243
Trade No.	9	9A	9B
Price	$5.00	7.00	11.50



Nos. 4244-4246.

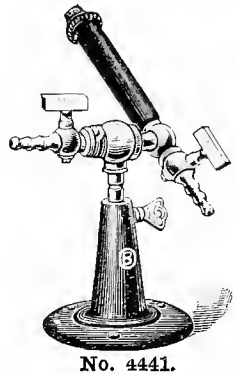
BELLOWS, improved pattern, doing away with injury to rubber disc. More convenient to operate.

Catalog No.	4244	4245	4246
Trade No.	10	10A	10B
Price	6.00	8.00	12.50

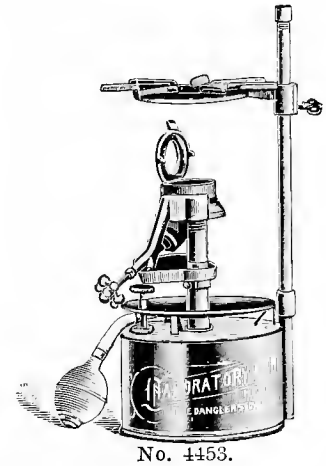
RUBBER DISCS for above Bellows.

Catalog No.	4247	4248	4249
Adapted to Nos.	9 and 10	9A and 10A	9B and 10B
Diameter, inches	9	12	14
Price	.67	1.15	1.65

4250. **NETS** for any size of above Bellows, each



No. 4441.

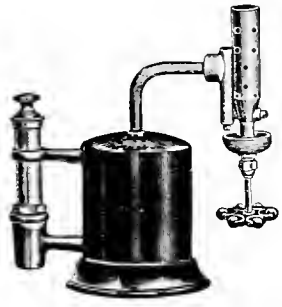


No. 4453.

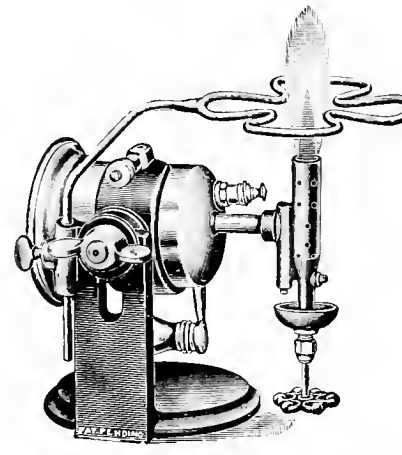
4441. **BLAST LAMP, Bunsen's**; the oldest and best blast lamp made

4453. **BLAST LAMP, Gasoline, "Dangler's Lamp."** An excellent substitute for gas, giving a high or low flame

For full line of General Apparatus and Supplies see Catalog M.



No. 4456.



No. 4457.

4456. **BLAST LAMP, Laboratory,** designed for general work where the laboratory is not equipped with gas. The Burner is rigid and is made of special bronze generator metal. It can be regulated from a small pointed flame to a large brush flame. The tank is made of heavy seamless drawn brass, fitted with patented automatic brass pump in handle.....Net $ 3.25

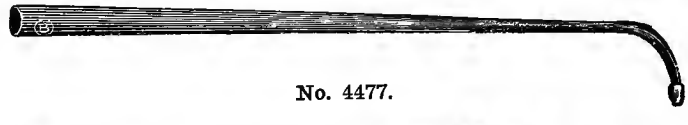
4457. **BLAST LAMP, Adjustable Laboratory,** fitted with adjustable stand and tripod. After nearly twenty-five years careful study on the part of the manufacturers, we offer our trade this outfit as the best and most convenient Laboratory Blast Lamp made. We call special attention to the many adjustable features. The adjustable stand permits the flame to be pointed in any position desired.

The Lamp itself is adjustable, pint size, made of the very best material, and produces a perfect blue flame of intense heat that can be easily regulated. It is strong and durable and is equipped with patented automatic brass pump-in-tank. The tripod, which also is adjustable, will hold any ordinary laboratory vessel and can be swung out of the way when not in use.

Complete with stand.....Net 5.00

4458. **BLAST LAMP** only of No. 4457.....Net 3.25

4459. **STAND** only of No. 4457.....Net 2.00



No. 4477.

No. 4478.

4477. **BLOW PIPE,** brass, plain. Length, inches.....	8	10	12
Price	.09	.10	.12
4478. **BLOW PIPE,** brass, with bulb. Length, inches.....	8	10	12
Price	.18	.20	.22

For full line of General Apparatus and Supplies see Catalog M.

No. 4541. No. 8056. No. 4543. No. 4545. No. 4545A. No. 4546. No. 4547. No. 4547A.

4541. **BOTTLES, Wide Mouth,** round, flint glass.

Capacity, ounces	1	2	4	6	8	12	16	32
Per dozen	$0.26	.30	.42	.50	.60	.70	.90	1.30

4542. **BOTTLES, Wide Mouth,** ronnd, green glass.

Capacity, gallons	½	1	2
Each	.20	.29	.67

4541A. **BOTTLES, Extra Wide Mouth,** round, flint glass.

Capacity, ounces	3	6
Per dozen	.38	.53

4543. **BOTTLES, Narrow Mouth,** round, flint glass.

Capacity, ounces	1	2	4	6	8	12	16	32
Per dozen	.25	.28	.38	.45	.50	.70	.85	1.25

4544. **BOTTLES, Narrow Mouth,** round, green glass.

Capacity, gallons	½	1	2
Each	.18	.31	.60

4545. **BOTTLES, Tinctures,** flint glass, mushroom stopper.

Capacity, ounces	1	2	4	8	16	32
Per dozen	.80	1.00	1.25	1.50	2.10	2.75

4545A. **BOTTLES, Tinctures,** best German flint glass, with flat topped glass stoppers carefully ground in, without mould marks. An excellent bottle for permanent use for reagents or solutions.

Capacity, ounces	1	2	4	8	16	32	½ gal.	1 gal.
Per dozen	1.11	1.25	1.50	2.00	2.66	3.75	6.65	11.00

4546. **BOTTLES, Acid,** green glass.

Capacity	Pint.	Quart.	½ Gal.
Each	.18	.25	.33

4547. **BOTTLES, Salt Mouth,** flint glass, mushroom stopper.

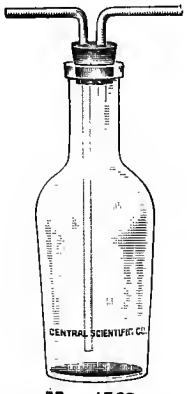
Capacity, ounces	1	2	4	8	16	32
Per dozen	1.00	1.05	1.33	1.50	2.10	2.90

4547A. **BOTTLES, Salt Mouth,** best German flint glass, with flat glass stoppers carefully ground in, heavy, nicely finished, without mould marks.

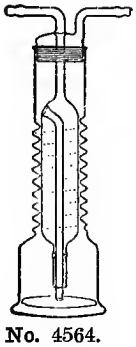
Capacity, ounces	1	2	4	8	16	32
Per dozen	1.25	1.40	1.60	2.25	3.10	4.50

For full line of General Apparatus and Supplies see Catalog M.

No. 4551.



No. 4563.



No. 4564.

No. 4565.

4551. **BOTTLES, Aspirator,** with glass stopper and stop cock.

Capacity	½ gal.	1 gal.	2 gal.
Each	$2.30	3.35	5.00

4553. **BOTTLES, Aspirator,** same as No. 4551, tubulature at bottom, but without glass stopper and stop cock.

Capacity	1 pt.	1 qt.	½ gal.	1 gal.	2 gal.
Each	.42	.60	.83	1.30	2.40

4563. **BOTTLES, Gas Washing,** with rubber stopper and fittings.

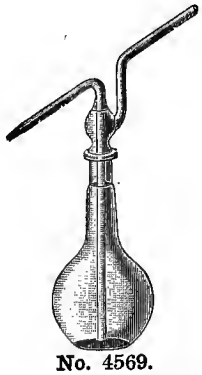
Capacity, pints	½	1	2
Each	.35	.45	.63

4564. **BOTTLE, Gas Washing, Screw Type.** So constructed that the gas bubbles are compelled to pass through a spiral about 120 cm. long, which insures a very efficient absorption. The inner tube is reflux, which prevents the liquid from rising to the top, and insures a continual circulation. With ground in stopper..... $ 3.35

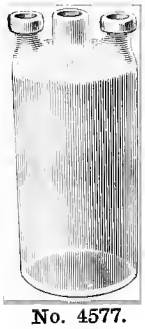
4565. **BOTTLES, Gas Washing, Drechsel's,** with tubes ground into the neck, high form.

Capacity, c.c.	125	250	500
Each	.65	.84	1.05

No. 4567.



No. 4569.



No. 4577.

4567. **BOTTLES, Washing,** with rubber stopper and flexible delivery tube.

Capacity, ounces	8	12	16	24	32
Each	.33	.42	.45	.55	.65

4569. **BOTTLES, Washing,** all glass, with tubes ground in the neck.

Capacity, ounces				8	16
Each				.90	1.10

4576. **BOTTLES, Woulff's,** with two necks.

Capacity, pints	¼	½	1	2	4
Each	.35	.40	.55	.70	1.05

4577. **BOTTLES, Woulff's,** with three necks.

Capacity, pints	¼	½	1	2	4
Each	.40	.45	.60	.83	1.25

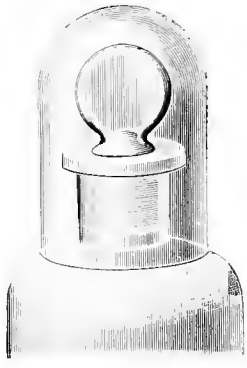
4578. **BOTTLES, Woulff's,** with two necks and opening at bottom.

Capacity, pints				1	2
Each				.85	1.05

For full line of General Apparatus and Supplies see Catalog M.

BOTTLES FOR REAGENTS

No. 4587.



No. 4593.

No. 4589.

The labels on these bottles are of raised letters blown in the glass, the surface of each letter being ground so as to render it perfectly distinct. The letter is therefore indestructible. The following lists will be found to contain the names of all the test solutions referred to in the United States Pharmacopoeia.

No bottle **WITH OTHER LABELS** in this type of bottle is manufactured. If, however, any name not in the list is especially desired, it may be engraved on blank bottles at an additional charge of 9c net per bottle.

PLEASE ORDER BY BOTTLE NUMBER.

4585. **REAGENT BOTTLES.** 1 oz., height 3⅝ inches. Per dozen..... $ 1.40

No.		No.	
326.	Cobaltous Nitrate.....$Co(NO_3)_2$	325.	Silver Nitrate (Amber).$AgNO_3$
336.	Gold Chloride .....$AuCl_3$	341.	Blank.
327.	Platinic Chloride .....$PtCl_4$		

4586. **REAGENT BOTTLES, Wide Mouth,** 1 oz., height 3⅛ inches. Per dozen..... 1.50

No.		No.	
374.	Ammonium Phosphate.$(NH_4)_2HPO_4$	372.	Test Paper.
361.	Am. Sod. Phosphate...$NaNH_4HPO_4$	353.	Sodium Acetate .....$NaC_2H_3O_2$
351.	Borax .....$Na_2B_4O_7$	369.	Sodium Bitartrate .....$NaHC_4H_4O_6$
364.	Copper .....Cu	350.	Sodium Carbonate .....Na_2CO_3
365.	Ferrous Sulphate.....$FeSO_4$	370.	Sodium Nitrate .....$NaNO_3$
366.	Ferrous Sulphide .....FeS	376.	Sod. Pot. Carbonate.....Na_2CO_3,K_2CO_3
367.	Potassium Chlorate....$KClO_3$	371.	Starch.
358.	Potassium Cyanide....KCN	373.	Zinc.
368.	Potass. Ferricyanide..$K_3Fe(CN)_6$	375.	Blank.
354.	Potassium Nitrate.....KNO_3		

For full line of General Apparatus and Supplies see Catalog M.

4587. **REAGENT BOTTLES,** 4 oz., height 5¼ in. Per dozen..... $ 1.95

No.			No.		
3.	Acetic Acid	$HC_2H_3O_2$	24.	Magnesium Sulphate	$MgSO_4$
30.	Alcohol	C_2H_5OH	25.	Mercuric Chloride	$HgCl_2$
18.	Ammonium Carbonate	$(NH_4)_2CO_3$	100.	Mercuric Potass. Iodide.	
17.	Ammonium Chloride	NH_4Cl	86.	Mercurous Nitrate	$Hg_2(NO_3)_2$
15.	Ammonium Hydroxide	NH_4OH	415.	Methyl Alcohol	CH_3OH
82.	Ammonium Molybdate	$(NH_4)_6Mo_7O_{24}$	411.	Methyl–Orange.	
19.	Ammonium Oxalate	$(NH_4)_2C_2O_4$	88.	Nessler's Solution.	
16.	Am. Sulphide (Amber)	$(NH_4)_2S$	5.	Nitric Acid	HNO_3
31.	Am. Sulphocyanide	NH_4CNS	422.	Nitric Acid, Con.	HNO_3
97.	Am. Sulphydrate	NH_4HS	93.	Oxalic Acid	$H_2C_2O_4$
33.	Barium Carbonate	$BaCO_3$	423.	Phenol	C_6H_5OH
20.	Barium Chloride	$BaCl_2$	412.	Phenolphthalein.	
32.	Barium Hydroxide	$Ba(OH)_2$	94.	Picric Acid	$C_6H_2OH(NO_2)_3$
401.	Barium Nitrate	$Ba(NO_3)_2$	37.	Platinic Chloride	$PtCl_4$
406.	Bromine Water.		8.	Potassium Carbonate	K_2CO_3
21.	Calcium Chloride	$CaCl_2$	96.	Potassium Chromate	K_2CrO_4
23.	Calcium Hydroxide	$Ca(OH)_2$	13.	Potassium Dichromate	$K_2Cr_2O_7$
22.	Calcium Sulphate	$CaSO_4$	11.	Potassium Ferricyanide	$K_3Fe(CN)_6$
83.	Carbon Disulphide	CS_2	6.	Potassium Ferrocyanide	$K_4(FeCN)_6$
407.	Chloroform	$CHCl_3$	12.	Potassium Hydroxide	KOH
408.	Cochineal.		10.	Potassium Iodide	KI
409.	Coralline.		9.	Potassium Sulphate	K_2SO_4
36.	Cupric Sulphate	$CuSO_4$	7.	Potass. Sulphocyanide	$KCNS$
35.	Ether	$(C_2H_5)_2O$	26.	Silver Nitrate (Amber)	$AgNO_3$
58.	Fehling's Solution.		404.	Silver Sulphate	Ag_2SO_4
29.	Ferric Chloride	Fe_2Cl_6	60.	Sodium Acetate	$NaC_2H_3O_2$
28.	Ferrous Sulphate	$FeSO_4$	59.	Sodium Carbonate	Na_2CO_3
2.	Hydrochloric Acid	HCl	416.	Sodium Cobaltic Nitrite.	
419.	Hydrochloric Acid, Con.	HCl	61.	Sodium Hydroxide	$NaOH$
428.	Hydrogen Peroxide.		14.	Sodium Phosphate	Na_2HPO_4
1.	Hydrogen Sul. (Amber)	H_2S	417.	Sodium Thiosulphate	$Na_2S_2O_3$
87.	Indigo Solution.		81.	Stannous Chloride	$SnCl_2$
414.	Iodine Solution	$I+KI$	4.	Sulphuric Acid	H_2SO_4
27.	Lead Acetate	$Pb(C_2H_3O_2)_2$	420.	Sulphuric Acid, Con.	H_2SO_4
410.	Litmus.		413.	Turmeric.	
90.	Magnesia Mixture.		38.	Blank.	

4588. **REAGENT BOTTLES.** Set of 40 of the above bottles (No. 4587), including the most common names used in the chemical laboratory. Includes Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 59, 61 and 3 blanks. Complete set in box..... 6.50

4588A. **REAGENT BOTTLES,** 4 oz., set of 24 according to Fresenius. Includes Nos. 2, 3, 4, 5, 6, 7, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 25, 26, 27, 29, 32, 36, 59 and 61. Per set..... 3.90

4588B. **REAGENT BOTTLES,** 4 oz., set of 12, consisting of Nos. 1, 2, 3, 4, 5, 15, 16, 20, 23, 26, 27 and 61. Per set..... 1.95

4589. **REAGENT BOTTLES, Wide Mouth,** 4 oz., height 4⅞ in. Per dozen..... 2.20

314.	Ammonium Sulphate	$(NH_4)_2SO_4$	313.	Sod. Am. Hyd. Phos.	$Na(NH_4)HPO_4+4H_2O$
304.	Borax	$Na_2B_4O_7$	301.	Sodium Carbonate	Na_2CO_3
305.	Ferrous Sulphate	$FeSO_4$	312.	Test Paper.	
303.	Potassium Cyanide	KCN	307.	Blank.	
302.	Potassium Nitrate	KNO_3			

4590. **REAGENT BOTTLES,** 8 oz., height 6½ in. Per dozen..... 2.50

131.	Acetic Acid	$HC_2H_3O_2$	152.	Lead Acetate	$Pb(C_2H_3O_2)_2$
126.	Alcohol	C_2H_5OH	153.	Mercuric Chloride	$HgCl_2$
110.	Ammonium Carbonate	$(NH_4)_2CO_3$	103.	Nitric Acid, Con.	HNO_3
109.	Ammonium Chloride	NH_4Cl	104.	Nitric Acid, Dil.	HNO_3
108.	Ammonium Hydroxide	NH_4OH	150.	Potassium Hydroxide	KOH
155.	Ammonium Molybdate	$(NH_4)_2MoO_4$	145.	Silver Nitrate (Amber)	$AgNO_3$
130.	Ammonium Oxalate	$(NH_4)_2C_2O_4$	112.	Sodium Carbonate	Na_2CO_3
122.	Am. Sulphide (Amber)	$(NH_4)_2S$	111.	Sodium Hydroxide	$NaOH$
114.	Barium Chloride	$BaCl_2$	129.	Sodium Phosphate	Na_2HPO_4
151.	Calcium Hydroxide	$Ca(OH)_2$	156.	Stannous Chloride	$SnCl_2$
154.	Ferrous Sulphate	$FeSO_4$	101.	Sulphuric Acid, Con.	H_2SO_4
105.	Hydrochloric Acid, Con.	HCl	102.	Sulphuric Acid, Dil.	H_2SO_4
106.	Hydrochloric Acid, Dil.	HCl	116.	Blank.	
107.	Hydrogen Sul. (Amber)	H_2S			

4591. **REAGENT BOTTLES, Pint,** 16 oz., height 7¾ in. Per dozen..... 3.60

204.	Ammonium Hydroxide	NH_4OH	222.	Hydrochloric Acid, Con.	HCl
227.	Am. Hydroxide, Dil.	NH_4OH+Aq	226.	Hydrodisodic Phosphate	Na_2HPO_4
229.	Am. Sulphide, Dil.	$(NH_4)_2S+Aq$	216.	Nitric Acid	HNO_3
218.	Barium Chloride	$BaCl_2$	219.	Nitric Acid, Con.	HNO_3
223.	Calcium Hydroxide	$Ca(OH)_2$	221.	Potassium Hydroxide	KOH
225.	Calcium Sulphate	$CaSO_4$	228.	Sodium Hydroxide, Dil.	$NaOH+Aq$
230.	Ether	$(C_2H_5)_2O$	215.	Sulphuric Acid	H_2SO_4
224.	Ferrous Sulphate	$FeSO_4$	220.	Sulphuric Acid, Con.	H_2SO_4
217.	Hydrochloric Acid	HCl	211.	Blank.	

4592. **REAGENT BOTTLES, Quart,** 32 oz., height 9½ in. Per dozen..... 4.45

505.	Hydrochloric Acid, Con.	HCl	502.	Sulphuric Acid, Dil.	H_2SO_4
506.	Hydrochloric Acid, Dil.	HCl	501.	Sulphuric Acid, Con.	H_2SO_4
503.	Nitric Acid, Con.	HNO_3	511.	Blank.	
504.	Nitric Acid, Dil	HNO_3			

4593. **CAPS,** for Reagent Bottles. Will fit Nos. 4585-4586. Per dozen..... .75

4594. **CAPS,** for Reagent Bottles. Will fit Nos. 4587-4589. Per dozen..... .80

4595. **CAPS,** for Reagent Bottles. Will fit Nos. 4590-4591. Per dozen..... 1.00

For full line of General Apparatus and Supplies see Catalog M.

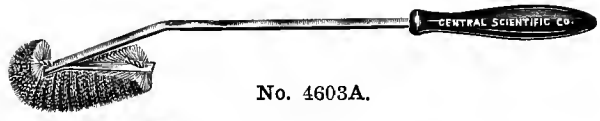
No. 4598.

No. 4599.

No. 4600.

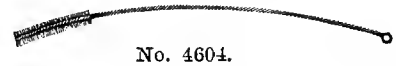
No. 4601.

No. 4603.



No. 4603A.

No. 4602.

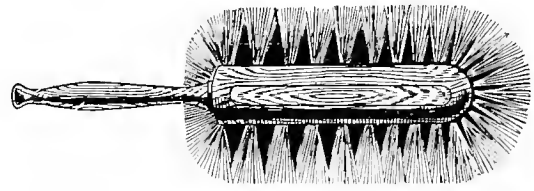


No. 4604.

4597. **BRUSHES, Test Tube,** bristle or tufted end, brass wire. Per dozen..... $ 0.67
4598. **BRUSHES, Test Tube,** bristle or tufted end, tinned wire. Per dozen..... .45
4599. **BRUSHES, Test Tube,** plain, tinned wire. Per dozen..... .40
4600. **BRUSHES, Test Tube,** sponge end, brass wire. Per dozen..... .67
4600A. **BRUSHES, Test Tube,** sponge end, tinned wire. Per dozen..... .55
4601. **BRUSH, Beaker,** wood handle. Each..... .22
4602. **BRUSH, Burette** (also for long tubes), 3 feet long, tinned wire. Each..... .10
4603. **BRUSH, Funnel,** taper end, wood handle. Each ..... .20
4603A. **BRUSH, Flask,** with pliable end, which adapts itself to the curvature of the flask. Each .33
4604. **BRUSHES, Small Tube,** bristle on tinned wire. Per dozen..... .12

No. 4605.

No. 4606.



No. 4607.

4605. **BRUSHES, Camel Hair.** "Pencils."

Size	Small.	Medium.	Large.
Per dozen	.15	.20	.27

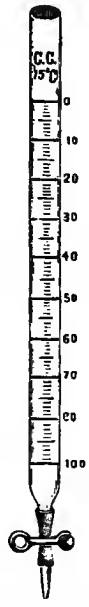
4606. **BRUSHES, Camel Hair,** for cleaning scale pans, instruments, etc. Flat, with wood handle.

Width, inches	½	1	1½	2
Each	.15	.18	.22	.33

4607. **BRUSH,** "Counter." All pure bristles. A laboratory necessity. Each..... .50

For **CYLINDER BRUSH** see page 91.
For **SOIL TUBE BRUSH** see page 39.
For **KING'S TUBE BRUSH** see page 26.
For **TEST BOTTLE BRUSHES** see page 91.

For full line of General Apparatus and Supplies see Catalog M.



No. 4614.

No. 4614A.

No. 4619.

No. 4619A.

4614. **BURETTES, Mohr's,** with tip and connection for pinch cock, but without pinch cock.

Capacity, c.c.	10	25	50	100
Graduated to	1/10	1/10	1/10	1/10
Each	$0.45	.67	1.00	1.80

4614A. **BURETTES, Mohrs,** with glass stop cock.

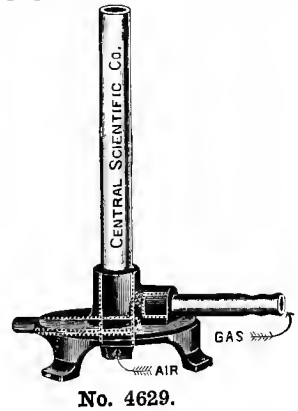
Capacity, c.c.	10	25	50	100
Graduated to	1/10	1/10	1/10	1/10
Each	1.00	1.25	1.65	2.20

4619. **BURETTE FLOAT, Erdmann's** ..... $ 0.25

4619A. **BURETTE FLOAT, Erdmann's,** with points to prevent adherence to the side of the burette ..... .40

For other **BURETTES,** see page 191.

No. 4625.



No. 4629.

No. 4621C.

No. 4631.

4625. **BURNER, Bunsen,** ordinary form, with air regulator 2

4627. **BURNER, Central Draft.** A new departure for students' use. Consists of only three pieces. No tip to clog up. Substances accidentally dropped into the tube will fall clear through to the table. Perfect combustion, long lived, inexpensive. Each, 20c; per dozen 2.0

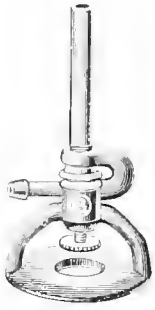
4629. **BURNER,** same as No. 4627, fitted with air damper. Each, 22c; per dozen 2.5

4621C. **WING TOP** for burners with $\frac{7}{16}$-inch tube 0

4631. **BURNER, Bunsen,** low form, with air regulator 4

4632. **BURNER, Bunsen,** for acetylene gas, with air regulator 1.0

For full line of General Apparatus and Supplies see Catalog M.



No. 4645.

No. 4647.

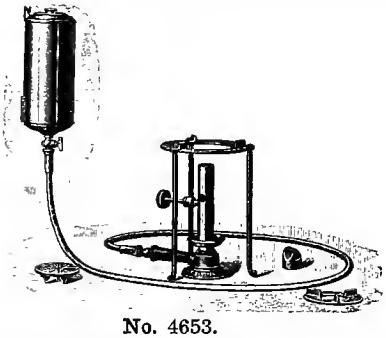
No. 4649.

4645. **BURNER, Boyce's Adjustable,** improved regulator. Burns either coal gas or gasoline gas. The best low-priced burner on the market, and the only adjustable burner made whose tube is stationary, whereby all attachments can be used with it to perfection ..... $ 0.75

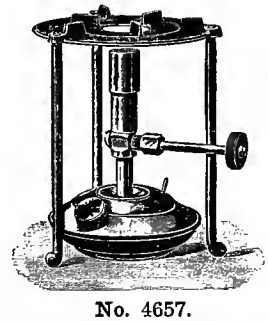
4647. **BURNER, Boyce's "Acme."** Considered by all who have used it to be the most perfect burner made. Burns either coal gas or gasoline gas, with regulator for both gas and air. **Flame cannot strike back.** Perfect combustion with high or low flame 1.40

4648. **BURNER, Boyce's,** same as No. 4647, without base. This is the only make of adjustable burner that can be mounted on a supply tube in any number for constructing different forms of heating apparatus for the chemist..... 1.10

4649. **BURNER, Tyrrell's,** completely adjusted for both coal and gasoline gas. Substantially constructed with regulator for both air and gas, and considered to be one of the best burners 1.10



No. 4653.

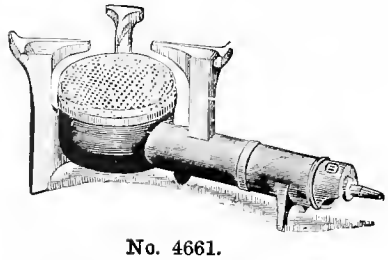


No. 4657.

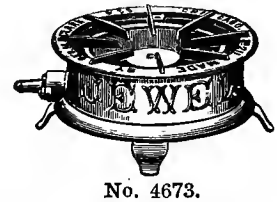
4653. **BURNER, Barthel's, Alcohol.** Requires no wick, very powerful. Complete with 1½ meters flexible metallic tubing and reservoir of 1 liter capacity. Without tripod.. 7.50

4655. **BURNER, Barthel's,** same as No. 4653, but without tubing 5.35

4657. **BURNER, Barthel's, Gasoline.** More powerful than the ordinary Bunsen Burner, for which it is an excellent substitute. Requires no wick. Without tripod..... 5.50



No. 4661.



No. 4673.

4661. **BURNER, Solid Flame.** Gas consumption, 35 feet per hour. This burner will boil ½ gallon of water in 5 minutes and melt 6 pounds of lead or solder in an iron ladle in 7 minutes. Diameter, 4½ inches..... 2.00

4663. **BURNER,** same as No. 4661, but for gasoline gas, with wheel valve..... 3.50

4673. **BURNER, Gas.** A portable gas table stove with cast iron top and base and Russia iron body. A steel drip pan is under the burner and the top is raised. Diameter, 9 inches; height, 4½ inches. Very useful in the laboratory..... 1.10

4673A. **BURNER, Gasoline,** same as No. 4673, furnished with valve and air regulator for burning gasoline gas 2.00

For full line of General Apparatus and Supplies see Catalog M.

No. 4681.

No. 4682.

No. 4683.

No. 4684.

4681. **CALCIUM CHLORIDE TUBES,** one bulb, straight delivery tube.

Length, inches	4	6	8
Each	$0.09	.10	.12

4682. **CALCIUM CHLORIDE TUBES,** two bulbs, straight delivery tube.

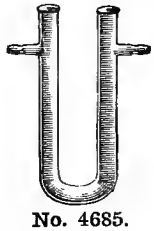
Length, inches	4	6	8
Each	.09	.12	.15

4683. **CALCIUM CHLORIDE TUBES,** Marchand's.

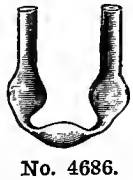
Length, inches	4	6
Each	.25	.33

4684. **CALCIUM CHLORIDE TUBES,** U form, plain.

Length, inches	4	5	6	8
Each	.11	.15	.17	.25

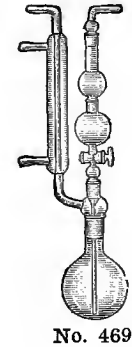


No. 4685.



No. 4686.

No. 4689.



No. 4695.

4685. **CALCIUM CHLORIDE TUBES,** U form, with side neck.

Length, inches	4	6	8
Each	.15	.23	.30

4686. **CALCIUM CHLORIDE TUBES,** Pelligot's.

Length, inches	5	8
Each	.35	.67

4689. **CALCIUM CHLORIDE JAR, Drying Tower.**

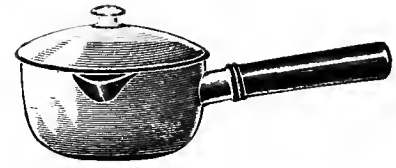
Height, inches	8	10	12
Each	.42	.50	.62

4695. **CARBONIC ACID APPARATUS, Knorr's,** for determination of carbonic acid in carbonates, especially baking powder, recommended by the Association of Agricultural Chemists ..... Net $ 6.75

For other **CARBONIC ACID APPARATUS** see page 9.

For full line of General Apparatus and Supplies see Catalog M.

No. 4700.



No. 4701.

4700. **CASSEROLES, Royal Berlin Porcelain,** with lip and porcelain handle, without cover.

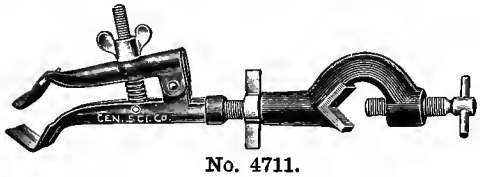
Number	1	2	3	3A	4	5
Capacity, c.c.	30	75	150	210	375	750
Diameter, mm.	50	70	85	95	110	135
Each	$0.40	.55	.60	.85	1.00	1.96

4701. **CASSEROLES, German Porcelain,** lipped, with cover and wooden handle.

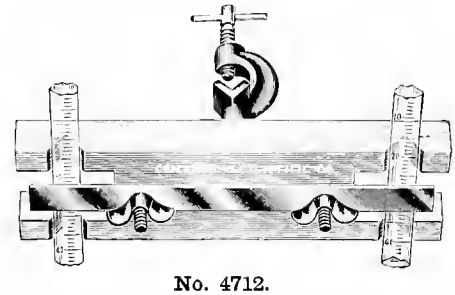
Capacity, c.c.	125	250	500
Diameter, mm.	90	100	135
Each	.45	.50	.80

4703. **CASSEROLES, Agateware.**

Capacity, ounces	16	32	64
Each	.22	.30	.40



No. 4711.

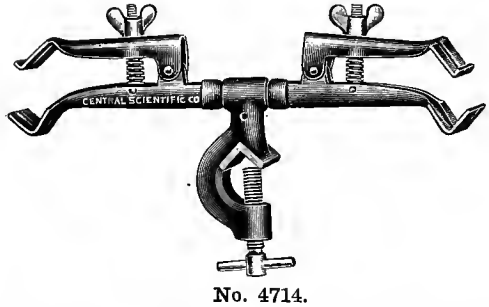


No. 4712.

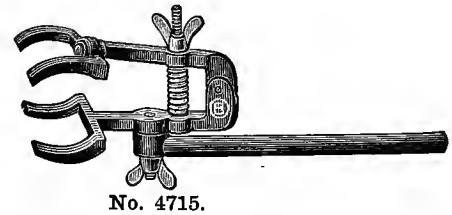
4711. **CLAMP, Burette.** New design with stamped steel jaws of such shape that tubes from ¼ inch up to $1\frac{3}{16}$ inches in diameter may be held without the use of corks or rubber. Without doubt the most convenient all round small size clamp that has been devised. Convenient for clamping thermometers and other small pieces of apparatus. Provided with check nut for adjusting the jaws in angular position and with a clamp for attaching to upright rod ..... $ 0.33

4720. **CLAMP, Burette.** Similar to No. 4711, but mounted on a rod 10 mm. in diameter and 15 cm. long ..... .25

4712. **CLAMP, Burette,** for two burettes, designed by Prof. Lincoln of University of Illinois. Burettes are held perpendicular and are easily removed. A very convenient and rigid clamp and nicely made 1.00



No. 4714.



No. 4715.

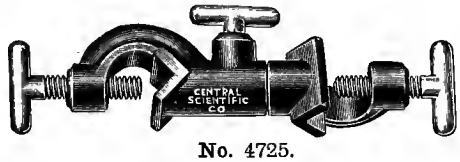
4714. **CLAMP, Burette, Hoffmann's,** double. Clamps same as in No. 4711 ..... .83
4715. **CLAMP, Universal,** with swivel jaws adapting themselves to irregular shapes ..... .60
4716. **CLAMP, Universal,** same as No. 4715, large size ..... .85

For full line of General Apparatus and Supplies see Catalog M.

No. 4718.

4718. **CLAMP, Condenser,** of stamped steel, will firmly hold tubes from ¼ inch up to 2½ inches in diameter. Rod 10 mm. diameter and 15 cm. long..... $ 0.33
4718A. **CLAMP, Condenser,** same as No. 4718, but rod 30 cm. long..... .45

No. 4723.



No. 4725.

4723. **CLAMP HOLDER,** iron, for fastening clamps to rod of support..... .18
4725. **CLAMP HOLDER,** same as No. 4723, with universal swivel movement..... .45

No. 4728.

No. 4728 (open).

No. 4732.

4728. **CLAMP, Screw Compressor,** new form, of brass, nickel plated; a combination of the old form and Hofmann's form. Can be placed upon any tubing except pressure tubing up to $\frac{5}{16}$ inch inside diameter without disconnecting apparatus ..... .20

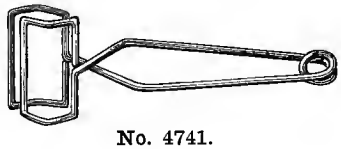
4728A. **CLAMP,** same as No. 4728, but for pressure tubing up to $\frac{5}{16}$ inch inside diameter and for ordinary tubing up to ½ inch inside diameter ..... .21

4728B. **CLAMP,** same as No. 4728, but for pressure tubing up to ½ inch inside diameter.. .22

4732. **CLAMP, Mohr's,** of brass, nickel plated, for burettes, etc.; suitable for light and medium wall tubing up to $\frac{5}{16}$ inch inside diameter. Length, 60 millimeters..... .09

4733. **CLAMP, Mohr's,** same as No. 4732. Length, 80 millimeters ..... .10

No. 4740.

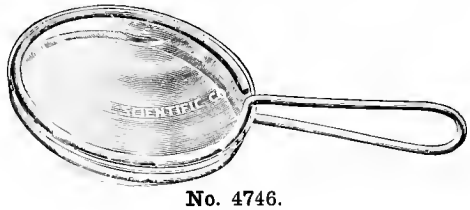


No. 4741.

4740. **CLAMP, Test Tube,** of wood, improved form, with brass spring..... .08

4741. **CLAMP, Test Tube, Stoddard's,** of spring brass wire ..... .08

No. 4745.

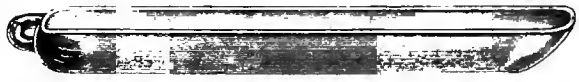


No. 4746.

4745. **CLAMP, Watch Glass,** of brass, for 2 to 2½ inch glasses 1

4746. **CLAMP, Watch Glass,** of brass, for 2½ inch glasses 1

For full line of General Apparatus and Supplies see Catalog M.



No. 4755.

4755. **COMBUSTION BOATS, Porcelain.**

Length, mm.	60	75	75	100
Width, mm.	10	11	15	18
Each	$0.22	.22	.22	.27

No. 4771.

No. 4771A.

4771. **COMBUSTION TUBE (Reduction Tube),** of Bohemian hard glass, with bulb on end.
Length, 15 cm ..... $ 0.18

4771A. **COMBUSTION TUBE (Reduction Tube),** of Bohemian hard glass, with bulb in center. Length, 15 cm ..... .20

4771B. **COMBUSTION TUBES, Bohemian Hard Glass,** straight, open at both ends, well annealed.

Length, cm.	30	45
Inside diameter, mm.	10	19
Each	.17	.50

No. 4772.

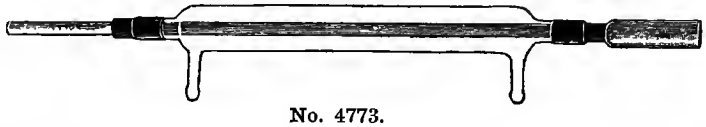
4772. **COMBUSTION TUBES, German Porcelain,** glazed inside.

Length, cm.	30	45	60
Diameter, outside, mm.	15	15	15
Each	.42	.80	1.40

4772A. **COMBUSTION TUBES, Fused Silica,** melting point about 1,500 degrees C.; unaffected by sudden changes in temperature.

Length, cm.	60	60	60
Inside diameter, mm.	15	18	21
Each ..... Net	3.50	4.20	4.60

For **COMBUSTION TUBING,** see page 150.



No. 4773.

4773. **CONDENSERS, Liebig's,** glass, with rubber connections.

Length, inches	15	20	24
Each	.95	1.10	1.50

4775. **CORKS, Regular Length,** XX quality. Diameters given are for the large end.

No.	0	1	2	3	4	5	6	7	8	9	10
Diameter, inches.	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
Per dozen	.03	.03	.03	.03	.03	.04	.05	.06	.07	.08	.09
Per gross	.15	.17	.17	.21	.23	.30	.33	.45	.55	.65	.80
No.	11	12	13	14	15	16	18	20	22	24	26
Diameter, inches.	1 1/16	1 1/8	1 3/16	1 1/4	1 5/16	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2
Per dozen	.10	.11	.12	.14	.16	.18	.22	.30	.35	.45	.55
Per gross	.90	1.00	1.05	1.20	1.35	1.65	1.95	2.20	2.90	3.50	4.00

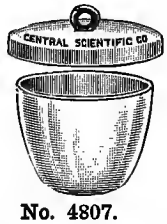
4776. **CORKS,** same as No. 4775. No. 0 to No. 11, assorted, in gross packages only.....

4778. **CORKS, Flat** (Specie Corks), XX quality. Diameters given are for large end.

Diameter, inches.	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4
Length, inches.	1/2	1/2	1/2	1/2	1/2	1/2	5/8	5/8	5/8	5/8	3/4
Per dozen	.08	.11	.15	.20	.25	.33	.44	.60	.70	1.00	1.40

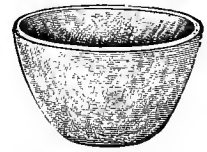
For full line of General Apparatus and Supplies see Catalog M.

No. 4800.



No. 4807.

No. 4819.



No. 4820.

CRUCIBLES, Hessian, Sand, round form. Dimensions are outside measurements.

No.	A	B	C	D	E
Height, mm.	66	76	89	101	114
Diameter, mm.	41	47	57	60	73
Each	$0.03	.04	.05	.06	.07
Per dozen	.25	.33	.45	.50	.66

CRUCIBLES, Royal Berlin Porcelain, glazed inside and outside, with cover.

No.	000	00	0	1	2	3	4	5
Capacity, c.c.	5	10	15	30	57	95	155	280
Diameter, mm.	26	30	35	41	52	62	72	87
Height, mm.	19	25	27	35	43	50	59	72
Each	.20	.23	.27	.38	.46	.59	.73	.87

CRUCIBLES, Gooch's, Royal Berlin Porcelain, glazed inside and outside, with perforated bottom.

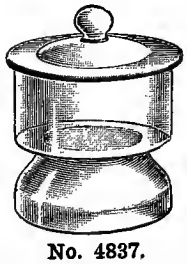
No.	2	3	4
Capacity, c.c.	10	25	35
Diameter, mm.	27	35	40
Height, mm.	30	40	43
Each	.35	.50	.55

CRUCIBLES, Fused Silica, 99.8% SiO_2. May be subjected continuously to temperatures up to 1200° C., and for short periods to much higher temperatures. Not affected by rapid changes of temperature, nor by acids, except hydrofluoric, and, above 400° C., phosphoric.

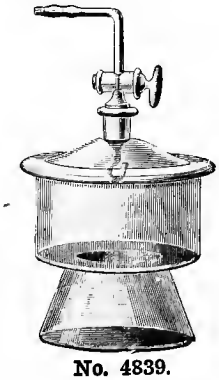
No.	00	0	1	2	3
Diameter, mm.	40	41	47	57	67
Height, mm.	20	25	28	37	45
Each, Net	.60	.60	.75	.90	1.25

CRUCIBLE COVERS, Fused Silica.

No.	1	2	3	4
Diameter, mm.	45	51	60	70
Each, Net	.50	.60	.75	.90



No. 4837.



No. 4839.

No. 4840.

DESICCATORS, Scheibler's, of Bohemian glass, cover ground air-tight.

Diameter, inside, inches	3½	5	6
Each	.60	1.00	1.20

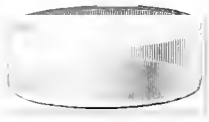
DESICCATOR, Scheibler's, vacuum, with stop-cock and hook, inside diameter, 5½ in.. $ 3.10

DESICCATOR, Atwater's. Inside diameter, 4½ inches; with triangle..... 1.65

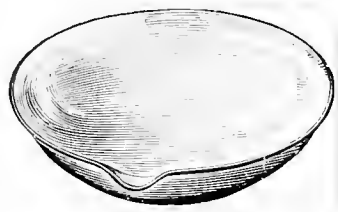
DESICCATOR PLATES, of porcelain, with three small feet and with 3 or 4 holes, according to size of plate.

Diameter, inches	3⅛	4¾	5½
Each	.67	.84	1.10

For full line of General Apparatus and Supplies see Catalog M.



No. 4845.



Nos. 4847-4849.

No. 4846A.

4845. **DISHES, Crystallizing, Light Glass,** with flat bottom and straight sides.

Diameter, inches....	2	3	4	5	6	8	10
Each	$0.10	.15	.22	.30	.40	.67	1.00

4846A. **DISHES, Graniteware.**

Diameter, cm.	15	18	22
Capacity, liters.....	½	1	2
Each	.17	.20	.22

4847. **DISHES, Evaporating, German Porcelain,** glazed inside.

No.	9	8	7	6	5	4	3	2	1
Diameter, inches.....	2½	3	3½	4	4½	5	5½	6	6¼
Capacity, ounces.....	1	2	2½	3½	6	7½	10	13	16
Each	.11	.13	.17	.19	.22	.27	.30	.40	.50

4848. **DISHES, Evaporating, German Porcelain,** same as No. 4847, but larger, with heavy rim.

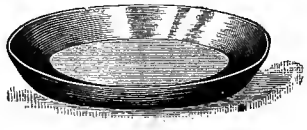
No.	6	5	4	3	2	1	0
Diameter, inches.....	7¾	8¼	9½	10½	11¼	12½	14½
Capacity, ounces.....	28	38	50	75	92	120	200
Each	.60	.67	.75	1.25	1.40	1.65	2.65

4849. **DISHES, Evaporating, Royal Berlin Porcelain,** glazed inside and outside.

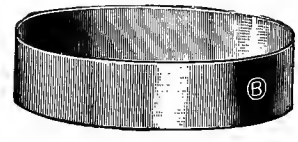
No.	00	0	1	2	3	4	5	6	7	8	9
Diameter, inches.....	2¾	3	3¼	3½	4	4¼	4¾	6	7	8¾	10¼
Capacity, ounces.....	2	3	3½	4½	6½	8	10	16	28	48	70
Each	.22	.25	.33	.38	.43	.48	.65	.76	1.05	1.25	1.80

4850. **DISHES, Evaporating, Fused Silica,** with lip. Unaffected by sudden or extreme changes of temperature. See further description under No. 4820.

No.	1	3	5	7	9
Diameter, mm.	51	70	83	89	98
Depth, mm.	21	25	30	22	30
Each .....Net	1.00	1.15	1.25	1.35	1.60



No. 4851.



No. 4853.

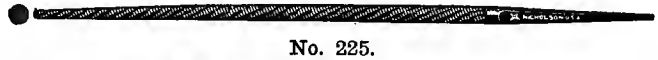
4851. **DISHES, Lead.**

Diameter, inches.....	2	3	4
Each	.10	.15	.20

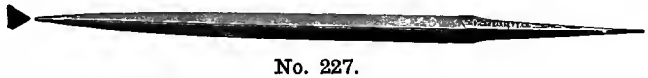
4853. **DISHES, Milk,** of aluminum, flat bottom, straight sides.

Diameter, inches.....	2	3	4
Height, inches.....	½	¾	1
Each	.21	.33	.50

For **DRYING OVENS** see pages 157-161.



No. 225.



No. 227.

225. **FILES,** round (rat tail), second cut.

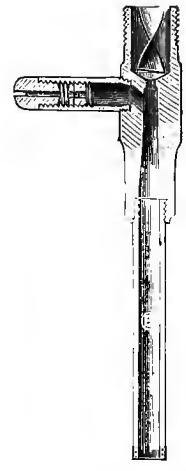
Length, inches.....	4	5	6	8
Each	.09	.10	.11	.13

227. **FILES,** triangular (slim taper), single cut.

Length, inches.....	4	5	6	8
Each	.07	.09	.10	.13

For full line of General Apparatus and Supplies see Catalog M.

No. 4881.



No. 4892.

No. 4893.

4881. **FILTER PAPER.** A pure white paper of superior quality, strong and rapid. For qualitative work. Cut in round filters, 100 in a package.

Diameter, cm	7.5	10	12.5	15	20	25	33
Per package	$0.10	.12	.15	.20	.30	.45	.60

4882. **FILTER PAPER,** same quality as No. 4881, in sheets 48 x 48 cm. Per quire, 40 cents; per ream ..... $ 6.65

4892. **FILTER PUMP (Aspirator).** New design. Constructed of brass on an entirely new idea and will produce a higher vacuum in less time and using one-third less water than any other pump made. Small size, ⅛ inch I. P. thread..... 1.25

4892A. **FILTER PUMP,** same as No. 4892, large size, ⅜ inch I. P. thread..... 2.00

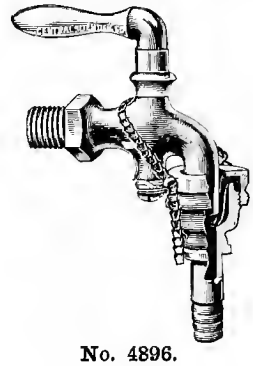
4893. **FILTER PUMP, Richards',** of brass, small size, ⅛ inch I. P. thread..... 1.50

4893A. **FILTER PUMP, Richards',** of brass, large size, ⅜ inch I. P. thread..... 1.80

4893B. **FILTER PUMP, Richards',** of brass, extra large size, ¾ inch I. P. thread..... 6.67

No. 4894.

No. 4895.



No. 4896.

No. 4897.

4894. **COUPLING, Filter Pump,** to connect Nos. 4892 or 4893 with threaded faucet..... .30

4894A. **COUPLING, Filter Pump,** to connect Nos. 4892A or 4893A with threaded faucet..... .50

4894B. **COUPLING, Filter Pump,** to connect No. 4893B with threaded faucet..... 2.25

4895. **COUPLING, Filter Pump,** to connect Nos. 4892 or 4893 with smooth faucet..... .50

4895A. **COUPLING, Filter Pump,** to connect No. 4892A or 4893A with smooth faucet..... .50

4895B. **COUPLING, Filter Pump,** to connect No. 4893B with smooth faucet..... 2.25

4896. **COUPLING, Universal.** This coupling is not threaded, but merely slipped on a faucet and fastened with a chain. Can be attached to any water faucet in a minute. The best and simplest device for attaching stills, water motors, turbines and centrifuges to a common faucet. It is practical, self-tightening and air tight..... 2.00

4897. **FILTER TUBES, Carbon Filters,** to fit Gooch crucibles.

Diameter at top, mm	25	30	35
Each	.22	.25	.30

For full line of General Apparatus and Supplies see Catalog M.

No. 4901.

No. 4901A.

No. 4902.

No. 4903.

4901. **FLASKS, Flat Bottom,** best German glass.

Capacity, ounces	1	2	4	6	8	12	16	24	32	64
Each	$0.07	.08	.09	.10	.13	.14	.18	.22	.27	.45

4901A. **FLASKS, Ring Neck,** best German glass, flat bottom.

Capacity, ounces	4	8	16	32
Each	.09	.13	.18	.27

4901B. **FLASKS, Flat Bottom,** new Jena glass, vial mouth.

Capacity, c.c.	50	100	200	500	700	1000
Each	.14	.15	.20	.31	.40	.50

4902. **FLASKS, Round Bottom,** best German glass.

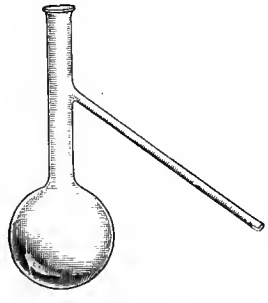
Capacity, ounces	2	4	6	8	12	16	24	32	64
Each	.08	.09	.10	.13	.14	.18	.22	.27	.45

4903. **FLASKS, Erlenmeyer's,** best German glass.

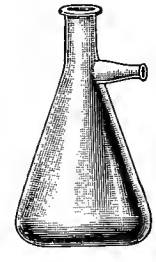
Capacity, ounces	2	4	6	8	12	16	32
Each	.08	.09	.11	.14	.16	.18	.30

4903A. **FLASKS, Erlenmeyer's,** new Jena glass, vial mouth.

Capacity, c.c.	50	100	250	500	750	1000
Each	.12	.14	.17	.30	.35	.50



No. 4904.



No. 4905.

No. 4906.

4904. **FLASKS, Fractional Distillation,** best German glass, side neck.

Capacity, ounces	2	4	8	16
Each	.18	.22	.30	.40

4905. **FLASKS, Filter, Erlenmeyer's** form with side neck, best German glass.

Capacity, ounces	8	16	32
Each	.30	.35	.55

4906. **FLASKS, Kjeldahl's,** digesting, pear shaped. Bohemian glass.

Capacity, c.c.	250	500
Each	.20	.35

4906A. **FLASKS, Kjeldahl's,** digesting, pear shaped, with extra long necks, new Jena glass.

Capacity, c.c.	200	500	1000
Each	.23	.40	.60

For full line of General Apparatus and Supplies see Catalog M.

No. 4907.

No. 4909.

No. 4910.

No. 4911.

4907. **FLASKS, Extraction, Soxhlet's,** low form, with extra wide mouth for extraction apparatus.

Capacity, c.c.	60	125	250
Each	$0.09	.12	.22

4907A. **FLASKS, Extraction, Soxhlet's,** New Jena glass, low form, extra wide mouth.

Capacity, c.c.	100	250
Each	.17	.25

4908. **FLASKS, Extraction, Knorr's,** for mercury seal. See page 64.

4909. **FLASKS, Volumetric,** or liter flasks, volume fixed with one mark on the neck, very accurate.

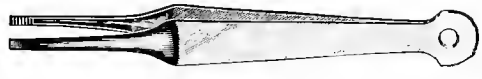
Capacity, c.c.	50	100	250	500	1,000
Each	.22	.25	.35	.50	.63

4910. **FLASKS, Volumetric,** same as No. 4909, with ground glass stopper.

Capacity, c.c.	50	100	250	500	1,000
Each	.26	.30	.50	.67	.75

4911. **FLASKS, Volumetric,** glass stopper, with two marks, so that exact amounts may be received and delivered.

Capacity, c.c.	100	500	1,000
Each	.45	.90	1.25



Nos. 4915-4916.

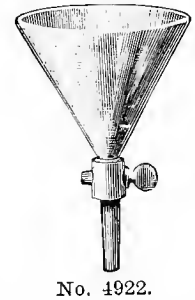
4915. **FORCEPS, Steel,** heavy, for general laboratory work.

Length, inches	4	5	6
Each	.09	.10	.18

4916. **FORCEPS, Brass,** same style as No. 4915. Length, 5 inches ..... .17

No. 4921.

No. 4921C.



No. 4922.

No. 4924.

4921. **FUNNELS, Glass,** angle of 60°, stem ground to a point.

Diameter, inches	1½	2	2½	3	3½	4	5	6	8
Each	.07	.08	.09	.12	.14	.16	.20	.22	.38

4921C. **FUNNELS, Glass, Ribbed.**

Diameter, inches	3½	4	6
Each	.14	.16	.22

4922. **FUNNELS, Separatory,** ordinary shape, 60°

Diameter, inches	4	6
Each	1.25	1.65

4924. **FUNNELS, Separatory,** cylindrical

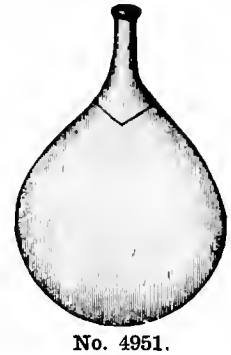
Capacity, c.c.	50	100
Each	.84	1.05

For full line of General Apparatus and Supplies see Catalog M.

No. 4926.

No. 4927.

No. 4928.



No. 4951.

4926. **FUNNEL TUBE, Thistle Top,** straight stem ..... $ 0.08
4927. **FUNNEL TUBE, Thistle Top,** simple safety stem ..... .17
4928. **FUNNEL TUBE, Thistle Top,** one bulb safety stem ..... .18
4951. **GAS BAGS, oval,** pure rubber.

Capacity	1 gal.	2 gal.	3 gal.	5 gal.
Each	2.20	2.75	3.35	3.75

4952. **GAS BAGS,** same as No. 4951, with brass stop-cock.

Capacity	1 gal.	2 gal.	3 gal.	5 gal.
Each	3.25	3.75	4.40	5.00

4973. **GAUZE, Iron Wire,** 20 mesh, to put under dishes.

Size, inches	4 x 4	5 x 5	6 x 6	sq. ft.
Each	.04	.06	.07	.27

4974. **GAUZE, Iron Wire,** 5 x 5 inches, with asbestos center ..... .10
4975. **GAUZE, Brass Wire,** 20 mesh, to put under dishes.

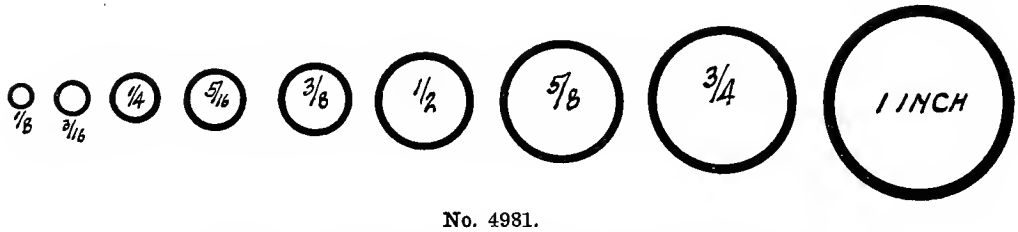
Size, inches	4 x 4	5 x 5	6 x 6	sq. ft.
Each	.08	.12	.15	.50

4977. **GAUZE, Copper Wire,** for combustion, etc.

Mesh	40	60	80	100
Per square foot	.55	.67	.90	1.80

4978. **GLASS BEADS,** used to create a large surface in tubes for absorption of gases, per lb. 1.00
4980. **GLASS ROD,** best German glass, free from lead, in 5-foot lengths, from ⅛ to ½ inch, per lb. ..... .44
4980A. **GLASS RODS, Stirring Rods,** with rounded ends.

Size, inches	5 x 5/16	8 x ¼	10 x ¼
Per dozen	.16	.33	.50



No. 4981.

GLASS TUBING IS LISTED BY OUTSIDE DIAMETERS.

4981. **GLASS TUBING, Best German Soft Glass,** in 5-foot lengths, sizes ⅛ to 1 inch, per lb. .44
4982. **GLASS TUBING, Best German Soft Glass,** sizes 1¼, 1⅜, 1½, 1¾ and 2 inches, per lb. .55

CAPILLARY TUBING IS LISTED BY INSIDE BORE.

4986. **GLASS TUBING, Capillary,** 6-7 mm. diameter, ¼, ½, ¾, 1, 1¼, 1½, 1¾ millimeter bore. Per lb. ..... .67

COMBUSTION TUBING IS LISTED BY INSIDE DIAMETERS.

4988. **GLASS TUBING, Combustion,** best Bohemian hard glass, from ⅜ to 1 inch inside diameter. Per lb. ..... .75

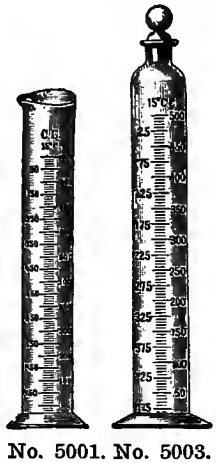
For **COMBUSTION TUBES,** with annealed ends, see page 144.

4989. **GLASS TUBING, Combustion,** new Jena glass, in 100 cm. lengths only.

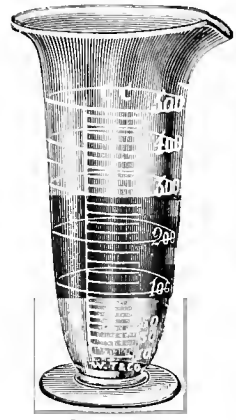
Diameter, outside, mm	12	18	20	25
Per length	.22	.33	.55	.67

For full line of General Apparatus and Supplies see Catalog M.

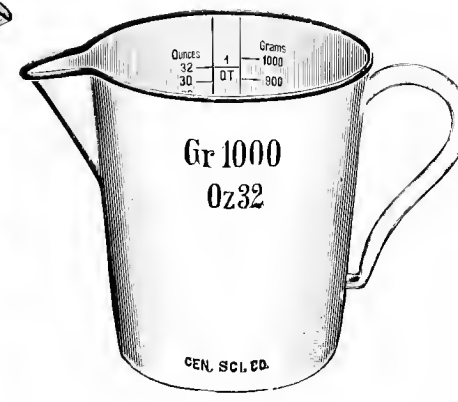
No. 4998.



No. 5001. No. 5003.



No. 5007.



No. 5009A.

4996. **GLOVES, Asbestos Mittens.** Per pair ..... $ 3.35

4998. **GLOVES, Rubber, Acid Gloves,** heavy, gauntleted.
Sizes for women, 6 to 9. Per pair 2.50
Sizes for men, 10 to 12. Per pair 2.50

4998A. **GLOVES, Rubber,** pure gum, short, per pair 1.10
Sizes 6 to 10. (Example: Kid Glove No. 8 takes Rubber Glove No. 10.)

5001. **GRADUATES, Cylindrical,** German glass. Double graduation, so that the divisions may be read up or down.

Capacity, c.c.	10	25	50	100	200	250	500	1000
Each	.27	.35	.45	.56	.75	.80	1.05	2.00

5003. **GRADUATES, Cylindrical,** same as No. 5001, with glass stopper.

Capacity, c.c.	50	100	250	500	1000
Each	.60	.76	1.05	1.50	2.25

5007. **GRADUATES, Cone Shape,** glass, metric measure.

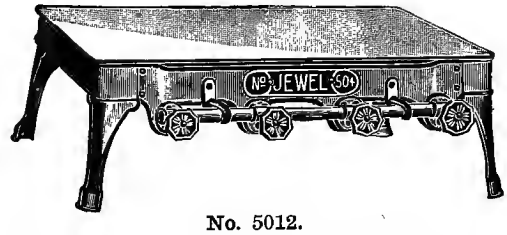
Capacity, c.c.	30	60	100	200	250	500	1000
Each	.25	.28	.33	.40	.55	.83	1.25

5009. **GRADUATES, Cone Shape,** glass, metric and English measure, double graduation.

Capacity, ounces	1	2	3	6	8	16	32
Capacity, c.c.	30	60	100	200	250	500	1000
Each	.30	.37	.45	.55	.65	1.00	1.65

5009A. **GRADUATES, Enameled.** These graduates are of seamless enameled ware and are plainly graduated on the inside in grams, ounces, and pints.

Capacity, grams	100	500	1000
Smallest division grams	10	50	100
Capacity, ounces	3	16	32
Smallest division ounces	1	2	2
Capacity, pints	..	1	2
Each ..... Net	.55	1.00	1.35



No. 5012.

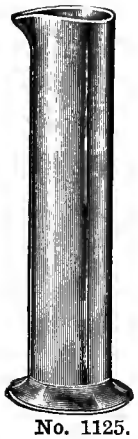
5012. **HOT PLATES, Drying Tables,** for use with gas. The top is of one piece of steel, with polished surface. The legs and frame are of cast iron. Flame easily regulated. Gives an even temperature.

Size of plate, inches	10 x 18½	14½ x 18½	18½ x 25½
Number of burners	1	2	3
Each ..... Net	6.25	9.00	14.00

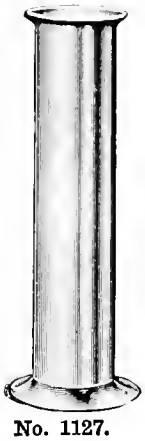
5013. **HOT PLATES,** same as No. 5012, but for use with gasoline gas.

Size of plate, inches	10 x 18½	14½ x 18½	18½ x 25½
Each ..... Net	6.90	10.00	15.40

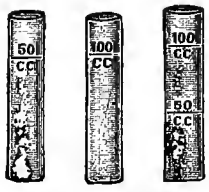
For full line of General Apparatus and Supplies see Catalog M.



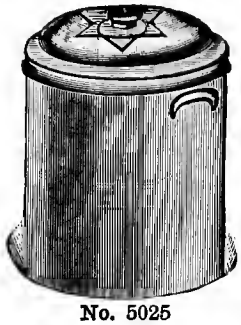
No. 1125.



No. 1127.



No. 5023.



No. 5025

1125. **JARS, Hydrometer, with lip.**

Size, inches	10 x 1½	12 x 2	15 x 2	15 x 3	18 x 3
Each	$0.30	.38	.50	.83	1.10

1127. **JARS, Hydrometer, with flange.**

Size, inches	10 x 1½	12 x 2	15 x 2	15 x 3	18 x 3
Each	.30	.38	.50	.83	1.10

5023. **JARS, Nessler's,** for ammonia tests in water analysis, of clear glass with ground and polished bottoms.

Graduated	50 c.c.	100 c.c.	50 and 100 c.c.
Each	.40	.50	.60

5024. **JARS, Nessler's,** tall form, 225 mm. high, graduated at 50 c.c. ..... $ 0.50

5024A. **JARS, Nessler's,** same as above, but in sets of six to agree. Per set 2.75

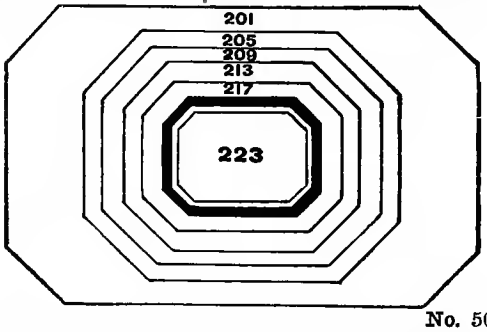
5025. **JARS, Stoneware,** with handles and covers for storing of ordinary chemicals. Are preferable to a galvanized iron can for the refuse from the chemical laboratory.

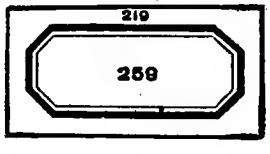
Capacity, gallons	½	1	2	4	6	8
Each	.33	.45	.50	.95	1.40	1.80

5027A. **JAR, Battery,** round form, 4 x 5 inches, capacity 1 quart ..... .17

5027B. **JAR, Battery,** round form, 5 x 7 inches, capacity ½ gal ..... .22

5027C. **JAR, Battery,** round form, 6 x 8 inches, capacity 1 gal ..... .27





No. 5035.

5035. **LABELS,** red border, gummed, rectangular.

Number	223	217	213	209	205	201	261	259	219
Per box	.07	.07	.07	.07	.07	.07	.07	.07	.07

Note.—Nos. 201, 205, 209, 213, 217 and 223 are shown full size in cut. No. 219 measures 18 x 40 mm., No. 259 measures 14 x 33 mm., No. 261 measures 15 x 50 mm.

5036. **LABELS,** red border, gummed, oval shape.

Number	241	239	229
Size, inches	½ x ¾	¾ x 1⅛	1¼ x 1¾
Per box	.07	.07	.07

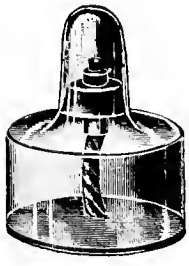
5037. **LABELS,** red border, gummed, rectangular.

Number	2001	2002	2003	2004	2005	2006	2007
Size, inches	1½ x 3⅞	1 x 3⅞	2 x 4¾	1 x 2¾	1⅞ x 4	1⅝ x 4	1⅝ x 2⅞
Per box	.25	.21	.42	.17	.33	.30	.20

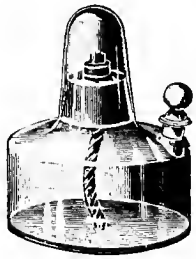
5039. **LABELS,** Chemical, gummed and perforated, per book ..... .45

For **LITMUS PAPER,** see page 167.
For **LITMUS PENCIL,** see page 162.

For full line of General Apparatus and Supplies see Catalog M.



No. 5045.



No. 5047.

No. 5049.

No. 5054.

5045. **LAMPS, Alcohol,** Bohemian glass, with ground cap, wick and wick holder.

Size, ounces	4	8
Each	$0.25	.40

5047. **LAMPS, Alcohol,** Bohemian glass, with side tubulation glass stoppered, ground cap, wick and wick holder.

Size, ounces	4	8
Each	.40	.50

5049. **LAMPS, Alcohol,** brass, with cap and wick.

Size, ounces	2	4
Each	.45	.50

5051. **LAMP WICKS,** for alcohol lamps Nos. 5045-5049. Per dozen..... $ 0.08

5052. **LAMP WICK HOLDERS,** brass, for Nos. 5045 and 5047. Per dozen..... .20

5053. **LAMP CAPS,** glass, for No. 5045 or No. 5047, 4-oz. size. Per dozen..... .85

5053A. **LAMP CAPS,** glass, for No. 5045 or No. 5047, 8-oz. size. Per dozen..... .85

5054. **LAMP, Alcohol Stove,** of brass, nickel plated. A powerful burner producing more heat than any other alcohol stove. Adopted by U. S. army and most European armies. It generates its own gas, has an invisible wick which never requires renewal, is smokeless and odorless. Weight, 8 ounces; capacity, 7 ounces..... 1.00

5054A. **LAMP, Alcohol Stove,** as used on Moisture Testers 3.00

For **MICROSCOPES,** see next page.

No. 5071.

Nos. 5073-5075.

No. 5077.

5071. **MORTARS, Iron,** vase shape, heavy, with pestle.

Capacity, pints	1	2	4	8
Size, inches	4½ x 5	5½ x 5	6½ x 6	8 x 7
Each	.45	.65	1.10	1.67

5072. **MORTARS, Iron, Chilled,** practically as hard as steel for powdering hard substances, with extra large heavy pestles.

Capacity, gallons	½	1
Size, inches	6½ x 6	8 x 7
Each	2.50	4.00

5073. **MORTARS, Porcelain,** shallow form, with porcelain pestle.

Number	6	5	4	3	2	1
Diameter, inches	2¾	3¼	4	4½	5½	6
Each	.33	.40	.48	.63	.75	.90

5075. **MORTARS, Wedgewood,** acid proof, pestle with wood handle.

Number	0000	000	00	0	1	2	3	4	5	6
Diameter, inches	2¾	3	3½	3¾	4½	5	5½	6	6½	7
Each	.33	.40	.50	.55	.60	.67	.83	1.00	1.30	1.65

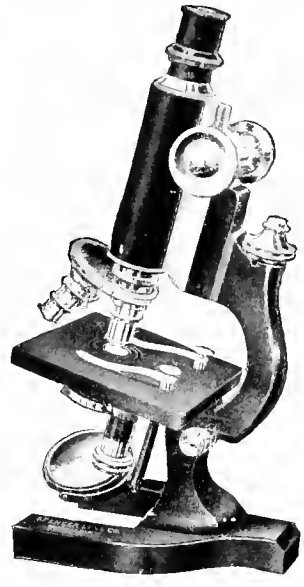
5077. **MORTARS, Glass,** with pestle.

Capacity, ounces	2	4	8	16
Diameter, inches	2¾	4	4½	5
Each	.22	.25	.33	.50

For full line of General Apparatus and Supplies see Catalog M.

MICROSCOPES AND ACCESSORIES

No. 45 SPENCER MICROSCOPE



SPECIAL FEATURES.

I. Size of stage, 112 mm. wide, 108 mm. deep.
II. Distance from optical axis to base of the arm, 80 mm.
III. Genuine vulcanite covers the whole of the top of the brass stage and edges as well, it being vulcanized directly to the brass, instead of being simply screwed to the stage.
IV. Nearly the whole microscope, including body tube, finished with our black alcohol-proof lacquer, thus avoiding the reflection of light into the eyes.
V. Compact construction, being made somewhat lower than microscopes of other makers and allowing greater ease in using.
VI. Fine adjustment bearings automatically lubricated and protected from dust.
VII. Fine adjustment ceases to work when objective is in contact with the cover glass.
VIII. The upper iris diaphragm is automatically locked open when condenser is in place.
IX. Symmetry of outline and beauty of finish.
X. Handle-arm for convenience and protection in handling.
XI. It is of low and compact construction, which enables one to use it with the greatest degree of ease and comfort.

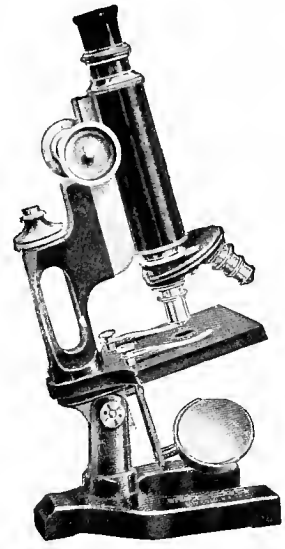
It is equipped with standard quick-screw substage with friction collar for the condenser, circular dust-proof nosepiece, upper and lower iris diaphragms, tube, rack and pinion, mirror and optical parts the same as used on our higher priced instruments. Prices include a neat hardwood cabinet.

Catalog No.	Abbe Condenser	Nose-piece	Achromatic Objectives Equiv. Foc. mm.	Eye-pieces	Price
45A	.....	.....	16, 4	10x	$32.50
45B	.....	Double	16, 4	10x	36.50
45C	.....	.....	16, 4	6x, 10x	34.00
45D	.....	Double	16, 4	6x, 10x	38.00
45H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	65.00

Drop-swing condenser mounting can be added for $5.00 additional.

For other MICROSCOPES see Catalog N.

No. 66 SPENCER MICROSCOPE



This Microscope, which has been on the market since 1906, has proved a great success. For elementary laboratory work in high schools, colleges and academies it has become the most popular of microscopes. Probably no microscope has ever been marketed which from the first met with more hearty approval. Within the past few years this microscope has been so completely rebuilt, enlarged and improved that to those who are unfamiliar with these developments it is almost an entirely new instrument. To those who contemplate equipment for elementary or general laboratory work the advantageous features of this microscope will surely commend themselves.

SPECIAL FEATURES.

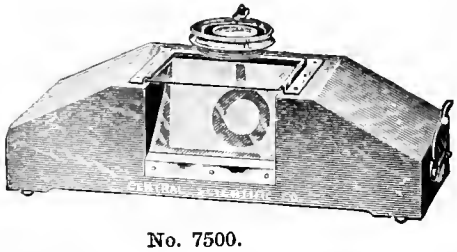
I. Size of stage, 95 mm. wide, 103 mm. deep.
II. Stage 112 mm. wide may be substituted at same price.
III. Distance from optical axis to base of arm, 60 mm.
IV. Genuine vulcanite covers the whole of the top of the brass stage and edges as well, it being vulcanized directly to the brass.
V. Black body tube, entire instrument alcohol-proof lacquered.
VI. Compact construction, it being made somewhat lower than usual, thus allowing greater ease in using.
VII. Fine adjustment bearings automatically lubricated and protected from dust.
VIII. Fine adjustment ceases to work when objective is in contact with the cover glass.
IX. Symmetry of outline and beauty of finish unexcelled.
X. Handle-arm for convenience and protection in handling.
XI. Iris diaphragm nearly flush with upper surface of the stage, and is operated by a knurled ring which can be reached from any side.

Prices include a neat hardwood cabinet.

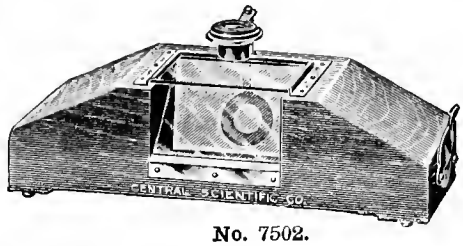
Catalog No.	Nose-piece	Achromatic Objectives Equiv. Focus mm.	Eye-pieces	Price
66A	.....	16, 4	10x	$27.50
66B	Double	16, 4	10x	31.50
66C	.....	16, 4	6x, 10x	29.00
66D	Double	16, 4	6x, 10x	33.00

Note.—The above outfits are suitable for the examination of starches, etc. For microorganisms such as yeasts, moulds and bacteria No. 66H at $60.00 should be purchased. This is supplied with Abbe condenser, N. A. 1.20, triple nose piece, and 1.8 mm. oil-immersion objective, in addition to the eye-pieces and objectives of No. 66D.

For other MICROSCOPES see Catalog N.



No. 7500.



No. 7502.

7500. **DISSECTING MICROSCOPE, Barnes,** hardwood polished base, movable glass stage mirror, and two lens magnifier. Fine screw and also sliding adjustment. Block is provided with pocket for holding dissecting tools. Each ..... $ 1.50

7502. **DISSECTING MICROSCOPE,** same block as No. 7500, fitted with 12× Doublet Magnifier which gives a perfect definition. Each 2.25

DOUBLETS

A

B

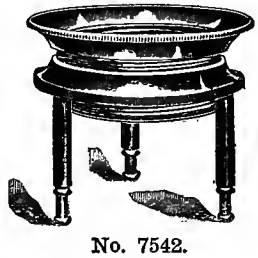
C

These are made with special reference to producing the best magnifier of the kind made. They consist of two plano-convex lenses very substantially mounted. They give excellent definition and an exceptionally large, flat field.

No.	Magnification	Focal Distance		Working Distance mm.	Real Field mm.	Price	
		Millimeters	Inches Approx.			Mount. a or b	Mount. c
7508	6×	41.6	1.6	22	22	$1.00	$1.25
7514	18×	13.9	0.5	8	8	1.00	1.25

Nos. 7532-34.

Nos. 7538-40.



No. 7542.

7528. **MAGNIFIER, Pocket,** the mountings are well seasoned rubber, very light and durable; in every respect a superior article; diameter of lens, 18 mm..... .35

7530. **MAGNIFIER, Pocket,** diameter of lens, 30 mm. ..... .55

7532. **MAGNIFIER, Pocket,** diameters of lenses, 15 and 18 mm..... .55

7534. **MAGNIFIER, Pocket,** diameters of lenses, 28 and 30 mm..... .90

7536. **MAGNIFIER, Pocket,** diameters of lenses, 12, 15 and 18 mm..... .65

7538. **MAGNIFIER, "Linen Tester,"** magnification about 10 diameters, nickel-plated brass mounting, with ¼-inch square aperture..... .27

7540. **MAGNIFIER, "Linen Tester,"** with ½-inch square aperture..... .27

7542. **MAGNIFIER, Tripod,** giving a large, clear field and sufficient magnifying power for elementary botanical and zoological studies. The lens is focused by screwing up or down in the brass frame..... .40

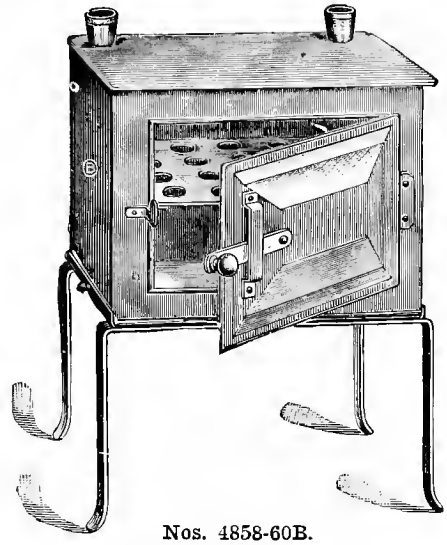
MICROMETERS

7606. **MICROMETER, Stage,** glass object slide with finely ruled scale, 1 mm. divided into 100 parts 3.50

7610. **MICROMETER, Eyepiece,** glass disc with finely ruled scale to be laid upon the diaphragm of an ordinary Huyghenian eyepiece, 5 mm. divided into 50 parts (to 0.1 mm.) 1.25

7612. **MICROMETER, Eyepiece,** same as No. 7610, divided into 100 parts (to 0.05 mm.)..... 1.50

For other Microscopes and Accessories see Catalog N.



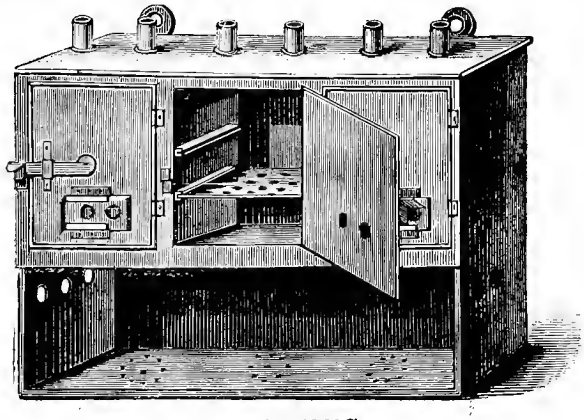
Nos. 4858-60B.

OVENS, DRYING.

Drying Ovens Nos. 4855-4860B are of heavy planished copper with tubulations for thermometer and gas regulator, and are mounted on separate iron supports provided with false bottom of sheet iron to protect the copper.

	Single Wall					Double Wall			
Cat. No.	Height outside, inches.	Width outside, inches.	Depth outside, inches.	Price.	Cat. No.	Height outside, inches.	Width outside, inches.	Depth outside, inches.	Price.
4855.	6	8	6	$ 5.00	4858.	6	8	6	$ 7.00
4856.	8	10	8	6.75	4859.	8	10	8	9.50
4857.	10	12	10	8.50	4860.	10	12	10	12.50
4857A.	18	24	18	30.00	4860A.	18	24	18	50.00
4857B.	18	36	18	52.00	4860B.	18	36	18	75.00

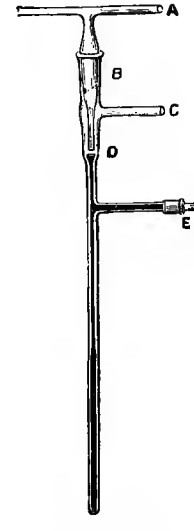
For **WATER GAUGE** and **WATER LEVEL**, see page 193.



No. 4860C.

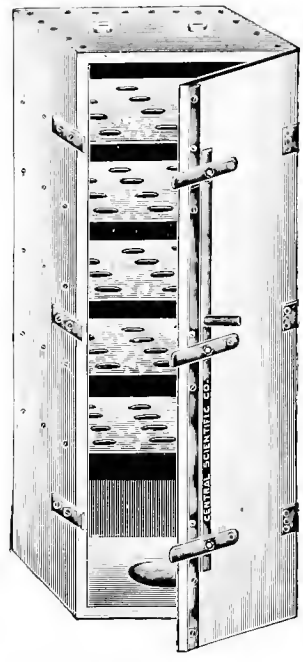
4860C. **OVEN, Drying.** Single wall, three compartments. Of heavy polished copper; 21 inches long, 8¾ inches high, 7 inches deep, with three chambers, each 7 inches deep and 7 inches wide; separate doors, ventilators and two tubulatures for each. Provided with sheet iron back and support, arranged for table or wall..... 22.00

8100. **THERMO-REGULATOR.** This improved Reichert Gas Regulator secures constant temperature at any desired point from 1° C. to near the boiling point of mercury. Especially adapted for water baths, drying ovens, sterilizers, etc. Each. 2.00



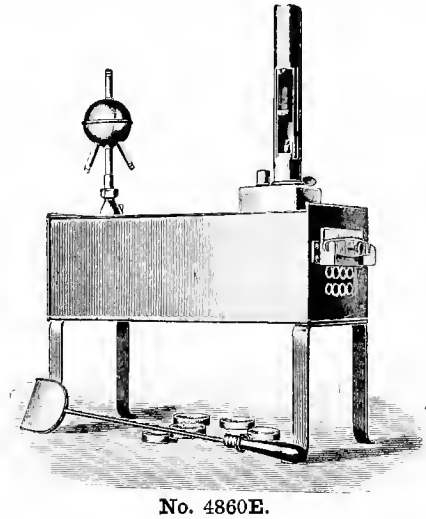
No. 8100.

For full line of General Apparatus and Supplies see Catalog M.



No. 4860D.

4860D. **OVEN, Asbestos Drying,** of the type used in the U. S. Bureau of Soils. This oven is very substantially made of heavy asbestos board, and measures 13 inches deep, 18 inches wide, and 48 inches high. Openings are provided at the top for thermometer and gas regulator and near the bottom for gas inlet tube. Very satisfactory for drying large quantities of soil samples. Complete with 5 removable shelves $ 50.00



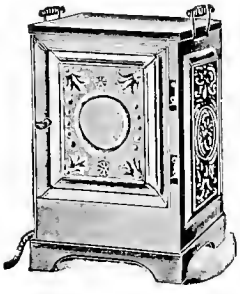
No. 4860E.

4860E. **OVEN, Soxhlet's Drying,** of copper, with Soxhlet copper bulb condenser, for the rapid determination of moisture. A determination of solids in milk can be made in about 18 minutes. Drying chamber 470 mm. long by 95 mm. wide by 30 mm. high. The water space between the double walls is to be filled with salt solution. Furnished complete with 5 nickel dishes with cover, shovel for dishes and thermometer .....Duty Free 44.50

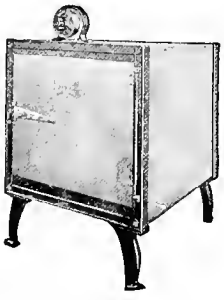
4860F. **OVEN, Soxhlet's Drying.** Similar to No. 4860E, but electrically heated, both the oven proper and the exhaust flue being provided with suitable heating units. With asbestos insulation. In ordering specify voltage desired .....Duty Free 70.00

For full line of General Apparatus and Supplies see Catalog M.

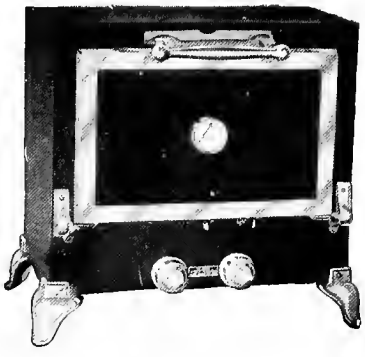
DRYING OVENS, ELECTRIC



No. 4861.



No. 4861B-C.



No. 4863.

The Electric Oven is the only device for laboratory work that gives the same measured amount of heat every time, distributes that heat evenly and is absolutely free from drafts. The double walls are packed with asbestos to conserve the heat, and when the door is closed the oven becomes an air-tight box. Within, at the top and bottom of the oven, are the two heating plates. As soon as the current is turned on, these at once become hot throughout their whole area and give a steady, measured heat to every part of the oven, a heat that comes from above as well as below; a heat that is the same every time with the same position of the switch, and the effect can be measured by the clock.

4861. **OVEN, Electric Drying.** Inside dimensions, 12 inches wide, 12 inches deep, 14 inches high. Weighs 30 lbs. Three heats. Four feet cord and plug switch. 1100 watts. (See note.) .....Net $ 20.00

4861A. **OVEN, Electric Drying.** Inside dimensions, 19 inches wide, 12 inches deep, 13 inches high. Weighs 60 lbs. Three heats. Four feet cord and plug switch. 1600 watts. (See note.) .....Net 25.00

4861B. **OVEN, Electric Drying.** Inside dimensions, 15 inches wide, 18 inches deep, 11½ inches high. Weighs 75 lbs. Three heats. Four feet cord and indicating snap switch on front. 1600 watts. (See note.).....Net 40.00

4861C. **OVEN, Electric Drying.** Inside dimensions, 15 inches wide, 18 inches deep, 11½ inches high. Weighs 76 lbs. Same style as No. 4861B, with thermometer. Three heats. Four feet cord and indicating snap switch on front. 1600 watts. (See note)...Net 45.00

4862. **OVEN, Electric Drying.** The walls and doors have an insulation two inches thick, and the construction of the door makes it practically heat tight. It is provided with a three point switch with a current consumption of 220, 440 and 880 watts, giving a maximum temperature of 450 degrees Fahrenheit which, when once reached, may be maintained indefinitely with the switch at low heat. Inside dimensions 10¼ x 11 x 9 inches. Complete with temperature indicator, attachment plug and cord. (See note.) .....Net 16.50

4863. **OVEN, Electric Drying.** Of same general description as No. 4862, but of better construction, with nickeled legs and trim, with two heating units, one each at top and bottom, controlled by separate switches giving nine degrees of heat. The oven is insulated so well that it has been found on a Pyrometer test that a baking temperature was maintained for an hour after the heat had been turned off. Maximum current consumption 1750 watts. Inside measurements 18 x 12 x 12 inches. Complete with temperature indicator, attachment plug and cord. (See note.).....Net 27.00

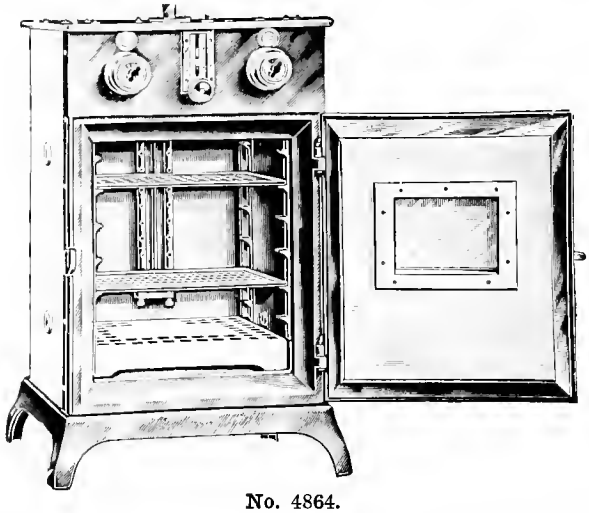
4863A. **OVEN, Electric Drying,** same as No. 4863 but with inside measurements of 18 x 18 x12 inches. Maximum current consumption 2100 watts. (See note.).....Net 35.00

Note.—In ordering state voltage desired. Unless otherwise specified ovens for 110 volt current will be sent.

For full line of General Apparatus and Supplies see Catalog M.

FREAS' ELECTRIC OVENS

Approved by the National Board of Fire Underwriters.



No. 4864.

The most accurate, reliable and durable Electric Ovens on the market. The Temperature Control is accurate and the range permits the oven to be used for drying, incubating, sterilizing, etc. The regulation of temperature takes but a few minutes.

The Temperature Range of the oven is from a degree or so above the air temperature to 175° C., and can be furnished for temperatures up to 500° F. The regulating device is sharp and accurate to within a fraction of a degree.

Description. The oven is constructed of heavy asbestos board which is durable, and conserves the heat so that the current consumption is reduced to a minimum. The asbestos is not attacked by acids or alkalies and can readily be cleaned by a cloth moistened in diluted acid. The oven is fitted with aluminum racks which allow the perforated shelves to be placed at any height. The frame of the door is made of a heavy aluminum casting insulated with asbestos and is provided with a mica window, with drop down shield, which allows inspection of the drying chamber without opening the door; a small electric lamp in the chamber, which can be lighted at will, facilitates the inspection. Perfect ventilation to rid the chamber of fumes or moisture is obtained by openings on each side and at the top of the oven; these openings may be closed at will by means of rubber stoppers. The heating element at the bottom of the chamber is wound with high resistance wire and is easily removed if necessary.

The Regulation Device, the most important feature of the oven, is fitted into a separate compartment above the chamber, safe from tampering, is constructed entirely of metal substantially built and cannot get out of order. Its action depends on the expansion of a metal tube passing through the chamber and operating a lever which makes and breaks a contact that is protected from arcing. The lever extended serves as an indicator operating up and down a graduated temperature scale on the outside of the oven. The indicator is moved to the desired temperature by simply turning the screw knob at the bottom of the scale.

4864. **OVEN, Freas' Electric,** No. 100, size of chamber 12 x 12 x 12 inches; mounted on cast iron base; complete with cord and plug to fit ordinary lighting circuit. (See note.) .....Net $ 75.00

4864A. **OVEN, Freas' Electric,** same as above but fitted with inside glass doors for incubating purposes, which may be removed when oven is to be used at a higher temperature. (See note.).....Net 80.00

4864B. **OVEN, Freas' Electric,** No. 110, same as No. 100, but with chamber 14 x 17 x 18 inches high; mounted on heavy iron base with legs, total height 5 feet; complete with flexible cord and plug. (See note.).....Net 175.00

4864C. **OVEN, Freas' Electric,** No. 112, same as No. 110, but graduated for temperatures up to 500 degrees Fahrenheit. (See note.).....Net 182.00

4864D. **OVEN, Freas' Electric,** No. 90, size chamber 7 x 7 x 10 inches high; without window in door, lamp, or switches for current and lamp. With these exceptions the oven is the same as the ordinary Freas' oven described above. (See note.).....Net 45.00

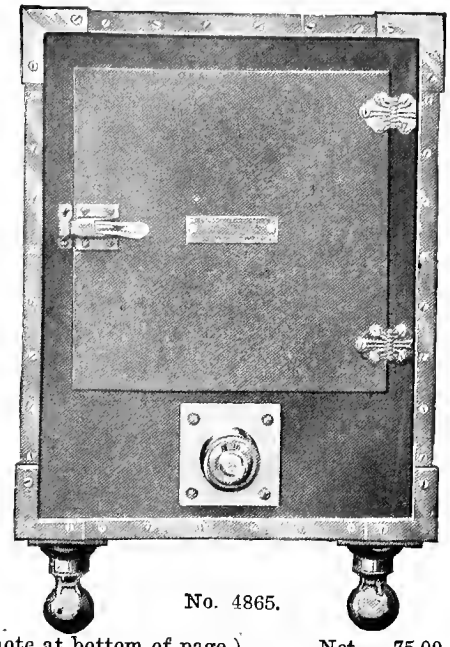
4864E. **OVEN, Freas' Electric,** No. 92, same as No. 90, but with glass window in door, switches and lamp. (See note.).....Net 50.00

4864F. **OVEN, Freas' Electric,** No. 94, same as No. 90, but fitted with inside door for incubating purposes, which is removable. (See note.) .....Net 47.50

Note.—When ordering state voltage and current to be used.

For full line of General Apparatus and Supplies see Catalog M.

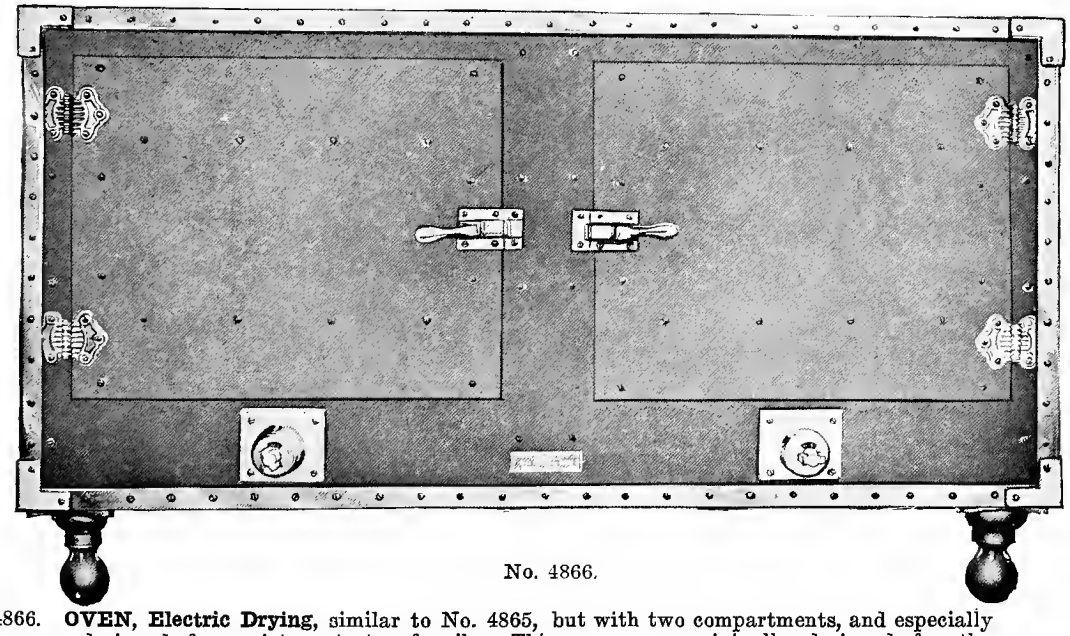
4865. **OVEN, Electric Drying,** especially designed for moisture determinations and practically uniform in temperature, having a three point regulating switch, whereby the temperature can be held at 212° Fahr. Provided with top and bottom ventilators, which, by creating a current of hot air continually passing through the oven, greatly expedite the drying process. Made of polished steel with angle iron corner construction, and with all fittings nickel plated, has 1-inch solid heat retaining walls of asbestos; outside dimensions, 16 inches wide, 20 inches high, and 20 inches deep; inside dimensions, 13 inches wide, 12 inches high, and 18 inches deep; maximum power consumption 250 watts; power consumption after first heating, 150 watts. With four removable screen shelves and tested thermometer. (See note at bottom of page).....Net $ 85.00



No. 4865.

4865A. **OVEN, Electric Drying,** same as No. 4865, but with outside dimensions 14 in. wide, 16 in. high, and 18 in. deep; inside dimensions 12 in. wide, 9 in. high, and 16 in. deep; maximum power consumption 200 watts; power consumption after first heating, 100 watts. With three removable screen shelves and tested thermometer. (See note at bottom of page.).....Net 75.00

4865B. **OVEN, Electric Drying,** same as No. 4865, but with outside dimensions 14 inches wide, 14 inches high, and 18 inches deep; inside dimensions 11 inches wide, 6 inches high, and 16 inches deep. With two removable screen shelves, and tested thermometer. (See note at bottom of page.).....Net 65.00



No. 4866.

4866. **OVEN, Electric Drying,** similar to No. 4865, but with two compartments, and especially designed for moisture tests of soils. This oven was originally designed for the North Dakota Agricultural College, and has met with very favorable reception in agricultural experiment stations. Either compartment may be used separately if desired, since they are non-interfering. Outside dimensions 50 in. wide, 24 in. high, and 22 in. deep; drying space each compartment, 20 in. wide, 16 in. high, and 18 in. deep; maximum power consumption of each compartment 150 watts. (See note.).Net 175.00

4866A. **OVEN, Electric Drying,** same as No. 4866, but with three compartments, and outside dimensions 72 in. wide, 24 in. high, and 22 in. deep. (See note.).....Net 215.00

Note.—In ordering state voltage desired; otherwise we will send ovens for 110 volts.

For full line of General Apparatus and Supplies see Catalog M.

No. 9142.

No. 5111.

No. 5117.

No. 5121.

No. 5123.

5103. **PENCIL, Blue,** for writing on glass, porcelain, etc. ..... $ 0.17

5105. **PENCIL, Litmus,** chemically pure litmus, made like an ordinary lead pencil, one end blue, the other end red..... Net .25

9142. **PERCOLATORS, Oldberg's,** heavy glass, narrow form, almost cylindrical.

Capacity	½ pt.	1½ pt.	2½ pt.
Each	.30	.40	.50

5111. **PIPETTES, Medicine Droppers,** rubber bulb, per dozen..... .30

5117. **PIPETTE, Long Bulb,** small ..... .09

5119. **PIPETTE, Long Bulb,** large ..... .10

5121. **PIPETTES, Volumetric,** accurately graduated.

Capacity, c.c.	1	5	10	12	15	20	25	30	50	75	100	200
Each	.09	.13	.17	.20	.21	.22	.27	.30	.33	.40	.45	.60

5123. **PIPETTES, Mohr's,** accurately graduated in 1/10 c.c.

Capacity, c.c.	1	2	5	10	20	25	50
Each	.22	.27	.37	.44	.55	.67	1.00

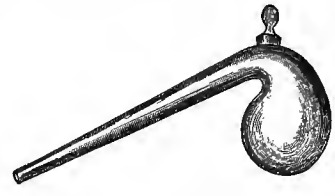
5130. **PLATES, Glass,** square, for covering beakers, etc.

Size, inches	4 x 4	6 x 6
Per dozen	.27	.55

5131. **PLATES, Glass,** ground on one side, for covering jars, etc.

Size, inches	2 x 2	3 x 3	4 x 4	6 x 6	8 x 8	10 x 10
Each	.04	.05	.06	.09	.15	.25

No. 5183.



No. 5187.

5181. **RETORT RECEIVERS, Glass,** with tubulature only.

Capacity, ounces	4	8	16	32
Each	.15	.21	.27	.36

5183. **RETORT RECEIVERS, Glass,** with tubulature and glass stopper.

Capacity, ounces	4	8	16	32
Each	.25	.33	.40	.60

5185. **RETORTS, Glass,** plain.

Capacity, ounces	4	8	16	32	64
Each	.13	.20	.25	.33	.42

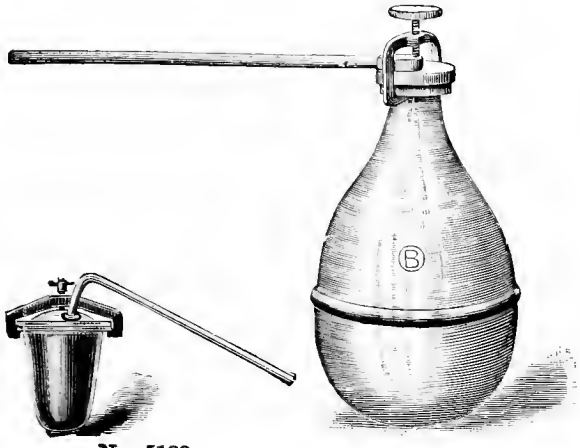
5187. **RETORTS, Glass,** with glass stopper.

Capacity, ounces	4	8	16	32	64
Each	.22	.25	.42	.50	.70

5188. **RETORTS, New Jena Glass,** with tubulature and ground in stopper.

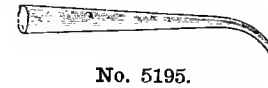
Capacity, c.c.	100	250	500	1000
Each	.50	.60	.84	1.10

For full line of General Apparatus and Supplies see Catalog M.



No. 5189. No. 5191.

No. 5193.



No. 5195.

5189. **RETORT, Iron,** for distilling mercury, etc.; cover removable, fastened by screw clamp, delivery tube reaching through the cover.

Capacity, pints	½	1	2	4	8
Each	$2.25	2.50	3.00	4.00	5.00

5191. **RETORT, Copper,** for making oxygen; flask shape, with iron clamp and delivery tube.

Capacity, pints	½	1	2	4
Each	2.25	2.50	3.00	3.35

5193. **RETORT ADAPTERS, Glass,** for connecting retorts with receivers; straight.

Diameter, inches, large end	½	1	1½	2
Each	.15	.18	.25	.40

5195. **RETORT ADAPTERS,** same as No. 5193; bent... .17 .20 .25 .40

No. 5201.

No. 5203.

5201. **RINGS, Iron,** for attaching to retort stands; with improved $\frac{5}{16}$-inch screw.

Diameter, inches	2	3	4	5	6	7
Each	.10	.13	.16	.17	.18	.20

5203. **RINGS, Iron,** "Extension," for fastening to retort stand by means of Clamp Holders Nos. 4723 and 4725.

Diameter, inches	3	4	5	6	7
Each	.09	.10	.12	.13	.15

5213. **RUBBER STOPPERS,** made from best quality of rubber, especially for chemical laboratory use, and will not harden from age. Each size furnished in three styles—solid, one hole or two holes. Per pound..... $ 1.75

Table Showing Approximate Number of Rubber Stoppers in One Pound.

Number	00	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Diameter large end, mm.	14	17	18	20	23	25	27	32	37	41	45	50	56	65	72
Diameter small end, mm.	9	12	15	16	18	20	23	26	30	33	37	42	50	59	68
Approximate Number in One Pound — Solid	120	80	60	55	42	33	28	20	15	12	11	8	6	5	4
Approximate Number in One Pound — 1 hole	130	90	65	60	45	35	30	21	16	13	11	8	6	5	4
Approximate Number in One Pound — 2 hole	138	94	70	64	47	38	32	22	17	14	12	8	6	5	4

For full line of General Apparatus and Supplies see Catalog M.

5215. **RUBBER TUBING, White,** best quality, hand made, medium wall.

Inside diameter, inches	1/8	3/16	1/4	5/16	3/8	1/2
Thickness of wall, inches	3/64	3/64	1/16	1/16	1/16	5/64
Per foot	$0.05	.07	.10	.11	.13	.22

5219. **RUBBER TUBING, Red,** Antimony, best imported; medium wall.

Inside diameter, inches	1/8	3/16	1/4	5/16	3/8	1/2
Thickness of wall, inches	3/64	3/64	1/16	1/16	5/64	3/32
Per foot	.06	.09	.13	.17	.22	.30

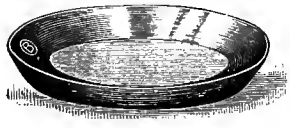
5221. **RUBBER TUBING, Black,** pure gum, best imported, medium wall.

Inside diameter, inches	1/8	3/16	1/4	5/16	3/8	1/2
Thickness of wall, inches	3/64	3/64	1/16	1/16	5/64	3/32
Per foot	.06	.10	.14	.18	.22	.33

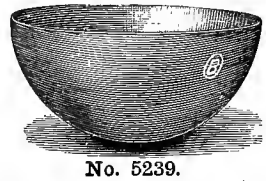
5223. **RUBBER TUBING, Band,** pure gum, for Gooch's crucibles, etc.

Diameter, inches	1	1¼	1½
Per foot	.25	.30	.40

For other **RUBBER TUBING**, see Catalog M.

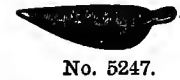


No. 5237.



No. 5239.

No. 5245.



No. 5247.

5237. **SAND BATHS.** Best Russia sheet iron, shallow form.

Diameter, inches	3	4	5	6
Each	.08	.10	.11	.15

5239. **SAND BATHS.** Best Russia sheet iron, hemispherical form.

Diameter, inches	3	4	5	6
Each	.10	.14	.15	.22

5245. **SCOOPS, Horn,** flat and wide, for ordinary use; square ends.

Length, cm.	10	12	14
Each	.18	.20	.25

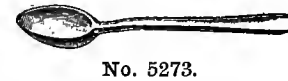
5247. **SCOOP, Agateware,** 3 x 5½ inches ..... $ 0.18

For **SOIL SCOOP** see page 8.
For **SIEVES**, see pages 30-1.

No. 5263.

No. 5271.

No. 5265.



No. 5273.

5261. **SPATULA, Glass,** 6 inch ..... .11

5263. **SPATULAS, Horn,** double end.

Length, inches	4	6
Each	.09	.16

5265. **SPATULAS, Steel,** wooden handle.

Length of blade, inches	3	4	5	6	8	10
Each	.22	.27	.30	.42	.55	.83

5271. **SPOONS, Horn,** superior quality, with spatula end.

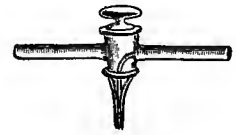
Length, inches	4	6
Each	.11	.17

5273. **SPOON, Glass,** teaspoon ..... .20

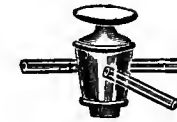
5273A. **SPOON, Glass,** tablespoon ..... .45

For full line of General Apparatus and Supplies see Catalog M.

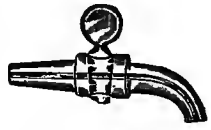
No. 5301.



No. 5303.



No. 5305.



No. 5307.

No. 5309.

5301. **STOP COCKS,** Glass, straight; bore, mm..... 2 3 4
Each $0.80 1.00 1.25

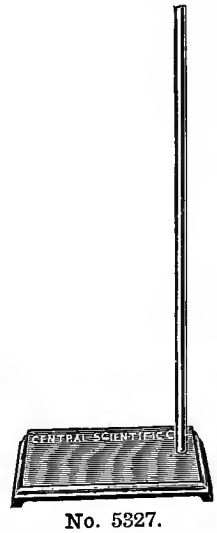
5303. **STOP COCK,** Glass, three way; bore, 2 mm..... $ 1.25

5305. **STOP COCK,** Glass, three way, with three tubes; bore, 2 mm..... 1.25

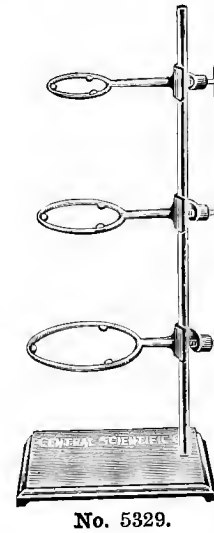
5307. **STOP COCK,** Glass, one end bent; bore, 4 mm., heavy Bohemian glass..... .90

5309. **STOP COCK,** Glass, four way, with four tubes; bore, 2 mm..... 1.33

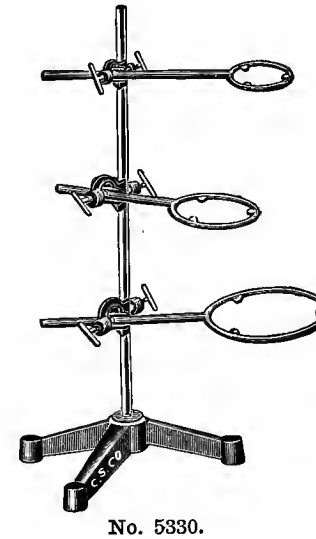
No. 5325.



No. 5327.



No. 5329.



No. 5330.

5325. **SUPPORTS, Tripod Base** of iron with coppered steel rod.

No.	1	2	3	4
Base	small	medium	large	ex. large
Rod, inches	18 x 5/16	20 x 3/8	24 x 1/2	36 x 1/2
Each	.30	.40	.62	.85

5327. **SUPPORTS, Rectangular Base** of iron with coppered steel rod.

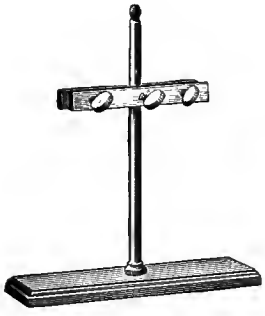
No.	1	2	3	4
Base, inches	4 x 6¾	5 x 8	5½ x 9	6 x 11
Rod, inches	18 x 5/16	20 x 3/8	24 x 1/2	36 x 1/2
Each	.25	.33	.55	.85

5329. **SUPPORTS (Retort Stands),** same as No. 5327, with rings.

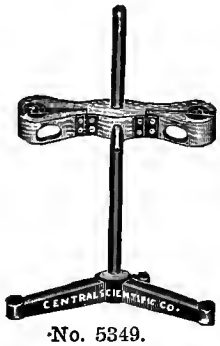
No.	1	2	3	4
Rings	3, 4 in.	3, 4, 5 in.	3, 4, 5, 6 in.	3, 4, 5, 7 in.
Each	.45	.60	.85	1.25

5330. **SUPPORTS,** same as No. 5325, No. 2, with No. 5203 Extension Rings, 3, 4 and 5 inches, and 3 No. 4723 clamp holders. Complete as illustrated..... 1.2

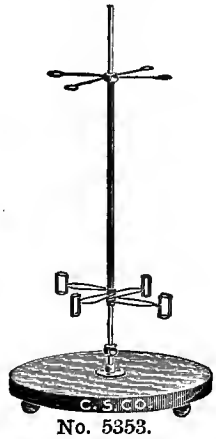
For full line of General Apparatus and Supplies see Catalog M.



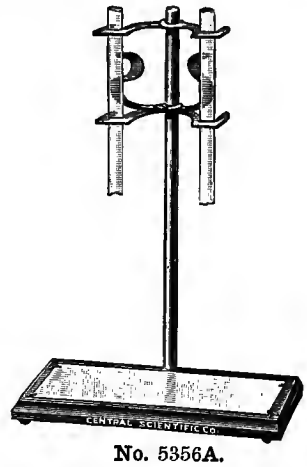
No. 5347.



No. 5349.



No. 5353.



No. 5356A.

5347. **SUPPORT, Burette,** of hardwood, for two burettes, cork lined..... $ 1.10

5349. **SUPPORT, Burette,** iron tripod and rod with hardwood arm, cork lined, for two burettes 1.65

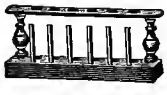
5353. **SUPPORT, Burette,** round hardwood base with nickel plated steel rod and revolving spring clamps for four burettes..... 3.35

5353A. **SUPPORT, Burette,** same as No. 5353, but with round porcelain base in place of the wooden base 6.25

5354. **SUPPORT, Burette,** same as No. 5353, for two burettes 4.00

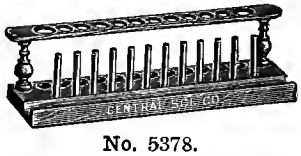
5354A. **SUPPORT, Burette,** same as No. 5354, but with round porcelain base in place of the wooden base 4.50

5356A. **SUPPORT, Burette,** improved design. Base of polished hardwood with rectangular piece of white glass on top. Rod and all metal parts of brass. The spring which holds the burettes in position is readily released, permitting of rapid changing and shifting of burettes, which are held rigidly parallel to each other. Without burettes 2.50

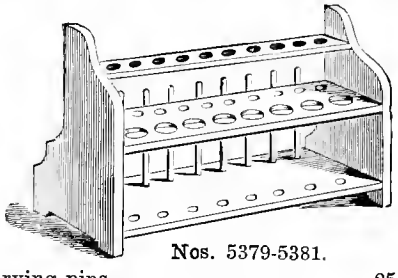


No. 5375.

No. 5377.



No. 5378.



Nos. 5379-5381.

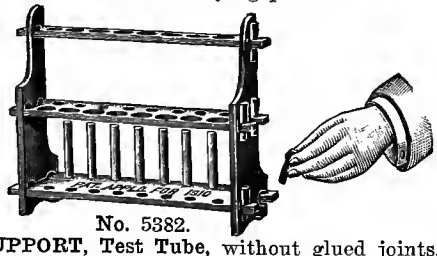
5375. **SUPPORT, Test Tube,** for 6 tubes. Heavy base with drying pins..... .25

5377. **SUPPORT, Test Tube,** for 10 tubes. Heavy base with drying pins..... .33

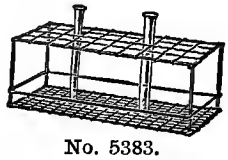
5378. **SUPPORT, Test Tube.** Designed by Prof. H. E. Griffith of Knox College. Has 10 holes for test tubes ¾ inch in diameter and 2 for test tubes 1 inch in diameter; has 12 drying pins. A valuable feature of this support is a trough at the foot of the drying pins for receiving drainage. This trough may also be used for holding tubes and stirring rods..... .45

5379. **SUPPORT, Test Tube,** for 13 tubes. Two rows of holes with drying pins..... .42

5381. **SUPPORT, Test Tube,** for 25 tubes. As used at the University of Chicago. Two rows of holes with drying pins..... .67



No. 5382.



No. 5383.

5382. **SUPPORT, Test Tube,** without glued joints, shipped "knocked down" with directions for putting together; for 16 tubes, with 8 drying pins..... .50

5383. **SUPPORT, Test Tube,** of wire. Will hold 40 tubes. Size 9½ inches long by 4½ inches wide by 3½ inches high..... .33

For full line of General Apparatus and Supplies see Catalog M.

No. 5395.

No. 5401.

5102D. **TEST PAPER, Litmus,** blue, per sheet, .04; per quire..... $ 0.67

5102E. **TEST PAPER, Litmus,** blue, per book..... .06

5102H. **TEST PAPER, Litmus,** red, per sheet, 04; per quire..... .67

5102J. **TEST PAPER, Litmus,** red, per book..... .06

For **LITMUS PENCIL** see page 162.

5395. **TEST TUBES,** well annealed, free from lead.

Size, inches	3x⅜	4x½	5x½	5x⅝	6x⅝
Per dozen	.15	.20	.22	.25	.28
Per gross	1.45	1.90	2.00	2.25	2.50
Size, inches	6x¾	7x⅞	8x1	10x1	12x1
Per dozen	.30	.40	.45	.80	1.25
Per gross	2.75	3.80	5.00	9.00	12.00

5401. **TEST TUBES, Side Neck.**

Length, inches	5	6	8	10
Per dozen	.60	.75	1.00	1.65

5403. **TEST TUBES, Ignition Tubes,** of Bohemian combustion tubing.

Size, mm.	100 x 14	130 x 16	160 x 20
Per dozen	.80	.90	1.25

5404. **TEST TUBES, Ignition Tubes,** of Jena combustion tubing.

Size, mm.	140 x 15	160 x 18
Per dozen	.95	1.12

5405. **TEST TUBES, Ignition Tubes,** heavy hard glass.

Length, inches	4	5	6
Per dozen	.45	.67	.80

For **TEST TUBE BRUSHES,** see page 138.

For **TEST TUBE HOLDERS,** see page 143.

5407. **THERMOMETER, Chemical,** enclosed paper scale, tube 200 x 7 millimeters; graduated to 110 degrees C..... .40

5408. **THERMOMETERS, Chemical,** enclosed hand written scale, 325 x 7 millimeters, in wood case.

Centigrade scale	—10 to 110°	—10 to 210°
Price, each	.60	.80

5408A. **THERMOMETERS, Chemical,** same as No. 5408, but with Fahrenheit scale

	17 to 220°	17 to 400°
Price, each	.60	.80

5408B. **THERMOMETER, Chemical,** same as No. 5408, with double scale; —10 to 110° C. and 17 to 220° F..... .80

5409. **THERMOMETERS, Chemical,** scale engraved on stem, white enameled back, 325 x 7 millimeters.

Centigrade scale	—10 to 110°	—10 to 210°	—10 to 360°
Price, each	.90	1.10	1.33

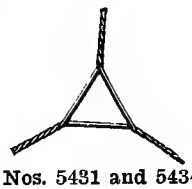
5409A. **THERMOMETERS, Chemical,** same as No. 5409, but with Fahrenheit scale

	17 to 220°	17 to 400°	17 to 600°
Price, each	.90	1.10	1.33

5409B. **THERMOMETER, Chemical,** same as No. 5409, with double scale; —10 to 110° C. and 17 to 220° F..... 1.40

For full line of General Apparatus and Supplies see Catalog M.

No. 5418.



Nos. 5431 and 5434.

Nos. 5432 and 5436.

5418. **TONGS, CRUCIBLE, Steel.** Double bend, 9-inch ..... $ 0.22
5418A. **TONGS, CRUCIBLE, Steel.** Double bend, 9-inch, nickel plated..... .33
5418B. **TONGS, CRUCIBLE, Brass.** Double bend, 9-inch ..... .35
5418C. **TONGS, CRUCIBLE, Brass.** Double bend, 9-inch, nickel plated..... .45

5431. **TRIANGLES, Iron Wire,** plain.

Number	1	2	3
Length of side, inside, inches	1½	2	2½
Per dozen	.42	.45	.45

5432. **TRIANGLES, Pipe Stem,** of iron wire, covered with pipe stems.

Number	1	2	3	4
Length of side, inside, inches	1½	2	2½	3
Per dozen	.63	.63	.67	.80

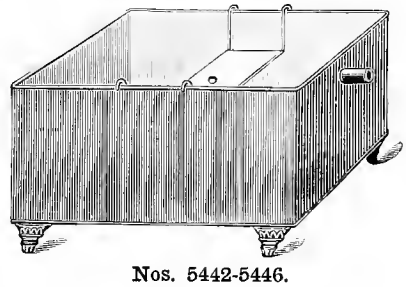
5434. **TRIANGLES, Nichrome Wire,** melting point about 3000° F., non-corrodible, cost but one-sixteenth that of platinum and last longer in service.

Number	1	2	3	4
Length of side, inside, inches	1½	2	2½	3
Each	.11	.11	.13	.13

5436. **TRIANGLES, Nichrome Wire,** covered with **Fused Silica Tubes,** a late product, superior to any triangle yet produced.

Number	1	2	3	4
Length of side, inside, inches	1½	2	2½	3
Each ..... Net	.25	.25	.35	.40

No. 5440.



Nos. 5442-5446.

No. 5463.

5438. **TRIPOD, Iron,** small, for spirit lamps ..... .22
5439. **TRIPOD, Iron,** for Bunsen burners, single ring.

Diameter, inches	5	6	8	10	12
Each	.22	.30	.42	.55	.75

5440. **TRIPOD, Iron,** malleable, same as No. 5439, with concentric rings.

Diameter, inches	5	6	8	10	12
Number of rings	2	3	4	5	6
Each	.28	.40	.50	.75	1.00

5442. **TROUGHS, Pneumatic,** of japanned tin with sliding shelf and overflow; students' size, 4½ x 6½ x 10 inches ..... .55
5444. **TROUGHS, Pneumatic,** of heavy japanned tin with sliding shelf and overflow, 6 x 11 x 16 inches 1.45
5446. **TROUGHS, Pneumatic,** heavy galvanized iron with sliding shelf and overflow, 5 x 9 x 12 inches ..... .90
5463. **TUBES, CONNECTING, U Shape,** of glass.

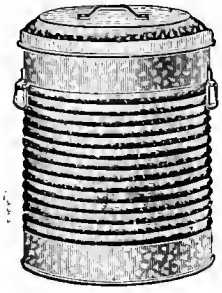
Size, inches	¼	⅜	½
Each	.08	.12	.17

5465. **TUBES, CONNECTING, Y Shape,** of glass..... .08 .12 .17
5467. **TUBES, CONNECTING, T Shape,** of glass..... .08 .12 .17
5469. **TUBES, CONNECTING, Y Shape,** of brass.

Size, inches	5/16	⅜	½
Each	.27	.33	.40

5471. **TUBES, CONNECTING, T Shape,** of brass..... .27 .33 .40
5473. **TUBE, CONNECTING, Y Shape,** of lead, ¼ inch ..... .20
5474. **TUBE, CONNECTING, Y Shape,** of hard rubber, ¼ inch..... .10

For full line of General Apparatus and Supplies see Catalog M.



No. 5581.

No. 5585.

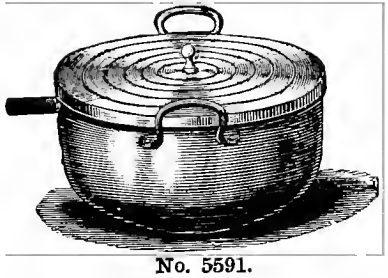
5581. **WASTE CAN,** galvanized, 14 x 14¼ inches; capacity, 9¼ gallons; with seamless cover fitting over outside ..... $ 1.10

For **WASTE JARS** see page 152.

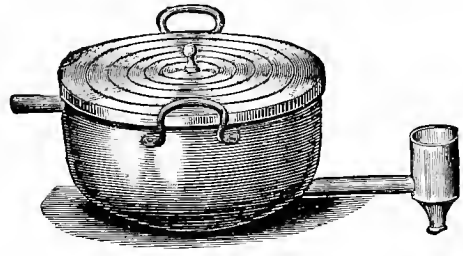
5585. **WATCH GLASSES,** best imported glass, well annealed, edges ground, used for covering beakers, etc.

Diameter, inches	1½	2	2½	3	3½	4	5	6
Per dozen	.22	.25	.50	.57	.75	.84	1.50	2.50

5587. **WATCH GLASSES,** counterpoised, for use on analytical balances; 2, 2½ or 3-inch. Per pair ..... .67



No. 5591.



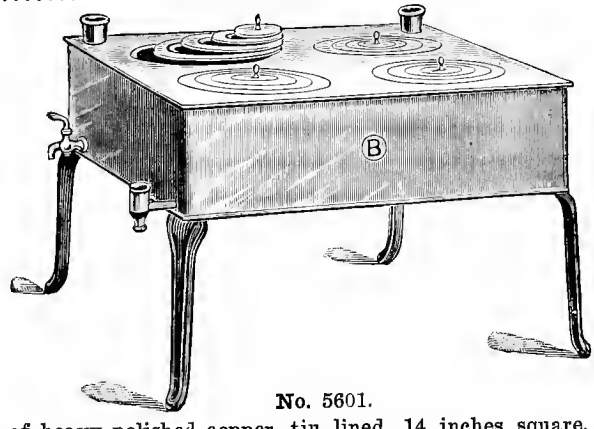
No. 5593.

5591. **WATER BATHS,** polished copper, tin lined, concentric copper rings and cover, handles and steam escape.

Diameter, inches	4	5	6	8
Number of rings	3	4	5	6
Each	.95	1.15	1.35	2.25

5593. **WATER BATHS,** polished copper, same as No. 5591, with constant water level.

Diameter, inches	4	5	6	8
Number of rings	3	4	5	6
Each	1.50	1.70	1.90	2.80



No. 5601.

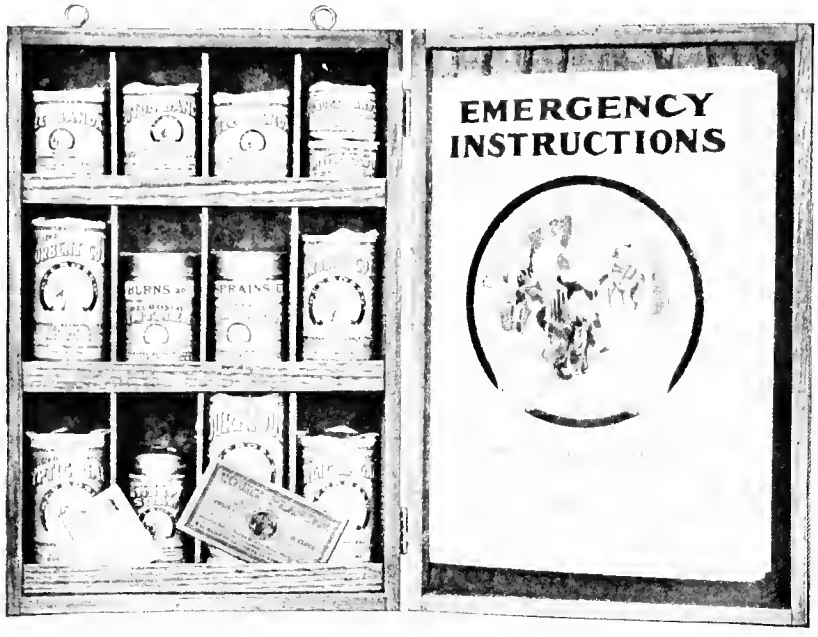
5601. **WATER BATH,** of heavy polished copper, tin lined, 14 inches square, 5 inches deep, with four openings 5 inches in diameter, provided with rings and cover. Has a stop cock to draw off the water, Kekulé's water level regulator, and an extra sheet iron bottom, and is mounted on a separate support 13.35

5602. **WATER BATH,** like No. 5601, 23 x 13½ x 5 inches with seven openings, three of 6 inches diameter and four of 4 inches diameter, with rings and cover 19.00

5603. **WATER BATH,** same as No. 5602, but arranged with coil for heating with steam 22.60

For full line of General Apparatus and Supplies see Catalog M.

MISCELLANEOUS SUPPLIES



No. 6300.

6201. **ASBESTOS PLATES or PADS**, iron bound edges, diameter 8 inches. Each..... $ 0.06

11001. **BLOTTERS**, good weight, best quality, 4 x 9½ inches. Per 100 sheets..... .25

6300. **CABINET, First Aid.** A neat hardwood case, 8 x 12 x 3¼ inches deep, containing the following: 1 Gauze Bandage, 1 inch; 2 Gauze Bandages, 2 inch; 1 Cotton Bandage, 2 inch; 1 can Mustard (specially prepared for emetics); 2 packages Absorbent Cotton; 1 package Styptic Gauze (medicated, to stop bleeding); 1 package Surgical Gauze (plain, for pads and compresses); 1 Tourniquet (to stop arterial bleeding); 1 can Powdered Antiseptic Soap (for washing hands and wounds); 1 can Recrosco Ointment (for burns, scalds, cuts, etc.); 1 can Kapsikar Embrocation (for use as counter-irritant for sprains, strains, congestion, etc.); 1 package Court Plaster; 3 Safety Pins; 1 envelope Hooks and Eyes (to hang case on wall). An excellent cabinet to have about the laboratory for treating cuts and burns.....Net 2.50

3380. **CANDLES, Paraffine,** twelve to pound. Per dozen..... .18

3381. **CANDLES, Paraffine,** six to pound. Per dozen..... .33

6204. **CEMENT, Quixo,** a chemically true cement, which hardens as it dries and when dry is not affected by fire or water. It will join anything to everything, with the exception of India rubber, vulcanite, celluloid and black lead. Per 6 ounce can.....Net .25

6209. **CHAMOIS SKINS,** for cleaning instruments, etc.

Size, inches	6 x 8	9 x 11	10 x 13	14 x 18
Each	.09	.17	.22	.45

6205. **CHEESE CLOTH,** best quality. Per yard..... .08

6215. **CLOTH, Emery.**

No.	000	00	0	1	2
Per sheet	.10	.10	.10	.10	.10
Per quire	1.20	1.20	1.20	1.20	1.20

11003. **CLOTH, Tracing,** thin, best quality.

Width, inches	30	36	38	42	48	54
Per yard	.45	.50	.61	.66	.90	.95

6219. **CORD, Mason's Chalk Line,** 1/16 inch. Per hank of 20 feet..... .06

6221. **CORD, Clothes Line,** ¼ inch. Per 100 feet..... 1.10

6225. **CORD, White Cotton,** ⅛ inch. Per hank of 50 feet..... .30

For full line of General Apparatus and Supplies see Catalog M.

MISCELLANEOUS SUPPLIES—Continued

No. 6241.

No. 6247.

8091. **FRUIT JARS, "Lightning" Sealing.** Per dozen, pint, $1.50; quart..... $ 1.65
8091A. **FRUIT JARS, Mason.** Per dozen, pint, 0.75; quart, 0.85; two-quart..... 1.10
6241. **GLUE, LePage's.**

Size	Bottle Small.	Bottle Large.	Can 2 oz.	Can 4 oz.	Can 8 oz.	Can 1 lb.
Each	.15	.22	.22	.28	.40	.65

6243. **GLUE, Marine,** waterproof, for projection cells, etc., per ounce bottle..... .27
6247. **LIBRARY PASTE, Sanford's Best.**

Style	Large Collapsible Tube.	4 oz. Screw Cap Jar.
Each	.15	.15

6256. **MATCHES, Swedish Safety,** in cartons of 12 boxes, per carton..... .11
6266. **PAPER, Carborundum.**

No.	000	00	0	1
Per sheet	.05	.05	.05	.05
Per quire	.65	.65	.65	.65

6265. **PAPER, Emery,** French.

No.	000	00	0	1
Per sheet	.05	.05	.05	.05
Per quire	1.00	1.00	1.00	1.00

6269. **PAPER, Sand.**

No.	00	0	1	2	3
Per sheet	.05	.05	.05	.05	.05
Per quire	.30	.30	.30	.30	.30

8119. **PENCILS, Drawing,** Faber's No. 4 H. Per dozen..... 1.25
8120. **PENCILS, Drawing,** Faber's No. 6 H. Per dozen..... 1.25
6272. **RUBBER BANDS,** assorted, in ¼ pound boxes..... 1.50
6273. **RUBBER CEMENT,** for cementing rubber joints, rubber, etc., per ounce bottle..... .15
For **SAND PAPER** see above.
6275. **SEALING WAX,** best red, four sticks to the pound, per pound..... .44
508. **SOLDER, Stick Form,** weight 2 pounds. Per stick..... .85
509. **SOLDER, Wire Form.** Per pound..... .40
509A. **SOLDER, Wire Form,** resin center. Per pound..... .60
6289. **SPLINTS,** 100 in package. Per package..... Net .10
6291. **SPONGES,** for cleaning purposes, 16 to a pound. Per pound..... 2.20
6293. **TAGS, Brass,** ¾ inch diameter, numbered. Per dozen..... .40
6298. **TOWELING, Crash,** good quality, 17 inches wide. Per yard..... .14
Per 50 yard bolt..... 5.50
8128. **TUMBLERS, Jelly,** with cap cover, 200 c.c. capacity. Per dozen..... .55
6298A. **TWINE, Cotton.** Per ball..... .11
6298B. **TWINE, Linen.** Per ball..... .40
6299. **WAX TAPERS.** Per box..... .11
6131. **WIRE, Annealed Steel.**

Stubb's Gauge No.	18	20	22	24
Per 4 ounce spool	.14	.15	.16	.16

6127. **WIRE, Steel Picture.**

No.	0	1	2
Per package, 15 yards	.08	.10	.11

For full line of General Apparatus and Supplies see Catalog M.

BOOKS ON AGRICULTURE

THE SCIENCE OF RURAL BUSINESS

FARM MANAGEMENT.

	Net.
Farm Management, F. W. Card	$ 2.00
Farm Management, C. W. Pugsley	1.50
Farm Management, G. F. Warren, Prof. Farm Management, Cornell	1.75
Laboratory Exercises in Farm Management. G. F. Warren and K. C. Livermore	.80
Farm Development, W. M. Hays	1.50

CO-OPERATION.

Co-operation Among Farmers: The Keystone of Rural Prosperity, J. L. Coulter.	1.00
Co-operation in Agriculture, G. H. Powell.	1.50
How to Co-operate, Herbert Myrick	1.00
Co-operative Finance, Herbert Myrick	2.50

BOOKKEEPING.

	Net.
Bookkeeping for Farmers, T. C. Atkeson	$ 0.25
Systematic Bookkeeping for Farmers, F. M. Baird	1.00
Farmer's Business Handbook, The, I. P. Roberts, Prof. Agr., Cornell	1.25
Farm Accounting, 2 Vols., Bextell	3.00
Farm Accounts, J. A. Vye	1.50
How to Keep Farm Accounts, Steiner	1.00

ECONOMICS—LAW.

Principles of Rural Economics, T. N. Carver, Prof. Pol. Econ., Harvard Univ.	1.30
An Introduction to the Study of Agriculture Economics, H. C. Taylor, Prof. Agr. Econ., Univ. of Wis	1.25
Law for the American Farmer, J. B. Green, New York Bar	1.50
Farmer's Manual of Law, H. E. Willis	2.00

AGRICULTURAL CHEMISTRY

	Net.
Analytical Chemistry, F. P. Treadwell	$ 3.00
The Chemistry of Plant and Animal Life, Harry Snyder	1.50
Exercises in Elementary Quantitative Chemical Analysis for Students of Agr., A. T. Lincoln and J. H. Walton, Jr., formerly of Univ. of Ill	1.50
Agricultural Chemistry, Ince and Tottingham, in prepr.	
Chemistry of Agriculture, Stoddard, in prepr.	
Chemistry in Its Relation to Daily Life, Hart and Kahlenberg	$ 1.25
General Agricultural Chemistry, Hart and Tottingham	1.50

AGRONOMY

MANURES AND SOIL FERTILITY.

	Net.
Bone Products and Manures, Thomas Lambert	$ 3.00
Book of Rothamstead Experiments, The, A. D. Hall	3.75
Farmers of Forty Centuries, F. H. King	2.50
Farm Manures, C. E. Thorne	1.50
Fertility and Fertilizer Hints, J. E. Halligan, Chemist, La. St. Exp. Sta	1.25
Fertility of the Land, The, I. P. Roberts, Emeritus Prof. Agr., Cornell	1.50
Fertilizers: The Source, Character and Composition of Natural, Home-Made and Manufactured Fertilizers, Etc., E. B. Voorhees, ex-Director N. J. Agr. Exp. Sta.	1.25
Fertilizers and Crops, L. L. Vanslyke	2.50
Fertilizers and Manures, A. D. Hall	1.50
Manures and Fertilizers, H. J. Wheeler, Agr. Expert Am. Agr. Chem. Co	1.60
Manures, Talks on, Joseph Harris	1.50
Principles and Practice of Agr. Chemical Analysis, Vol. I, Soils, H. W. Wilcy	4.00
Principles and Practice of Agr. Chemical Analysis, Vol. II. Fertilizers and Insecticides, H. W. Wiley	4.50
Principles and Practice of Agr. Chemical Analysis, Vol. III. Agr. Products, H. W. Wiley	6.00
Principles of Agricultural Chemistry, G. S. Fraps, Prof. Agr. Chem., Texas Agr. Coll.	$ 4.00
Soil, The, A. D. Hall	1.50
Soils, S. W. Fletcher	2.00
The Story of the Soil, C. G. Hopkins	1.50
First Principles of Soil Fertility, Alfred Vivian, Ohio State Univ	1.00
Soil Fertility and Permanent Agriculture, C. G. Hopkins, Prof. Agronomy, Univ. of Ill.	2.25
Soil Fertility and Fertilizers, J. E. Halligan, Chemist, La. St. Exp. Sta	3.50
Soil Fertility Laboratory Manual, C. G. Hopkins and J. H. Pettit, Univ. of Ill.	.60
Soil Solution, The, F. K. Cameron, U. S Dept. of Agr	1.25
Soils and Fertilizers, Harry Snyder, formerly Prof. of Agr. Chem. and Soils, St. Paul, Minn	1.25
Soil Conditions and Plant Growth, E. J. Russell, Rothamstead	1.50

WEEDS.

Common Weeds of the Farm, H. C. Long.	2.00
Quack Grass Eradication, P. B. Crane	1.00
Weeds and How to Eradicate Them, Thomas Shaw	.50
Weeds of the Farm and Garden, L. H. Pammel	1.50
Weeds, Ada E. Georgia	2.00

AGRONOMY—Continued

FARM CROPS.

	Net.
Alfalfa, The Book of, F. D. Coburn	$ 2.00
Alfalfa, Joe Wing	2.00
Alfalfa, F. D. Coburn	.50
Broom Corn Culture, A. G. McCall	.50
The Cereals in America, T. F. Hunt	1.75
Clovers and How to Grow Them, Thomas Shaw	1.00
The Study of Corn, V. M. Shoesmith	.50
Corn Book, M. L. Bowman and B. W. Crossley, formerly of Iowa St. College	2.00
Corn Culture, C. S. Plumb	1.00
The Book of Corn, Herbert Myrick	1.50
Corn Judging Manual, A. D. Shamel	.50
Corn Plants, Sargent	1.75
Crops and Methods for Soil Improvement, Agee	1.25
Crop Rotation and Field Management, E. C. Parker	1.50
The Knapp Method of Growing Cotton, H. E. Savely and W. B. Mercier	1.00
Examining and Gradi_g Grains, T. L. Lyon and E. G. Montgomery, Cornell	.60
Farm Grasses of the U. S. of America. W. J. Spillman	1.00
Feeding of Crops and Stock, A. D. Hall	1.50
Field Crops, A. D. Wilson, Univ. of Minn., and C. W. Warburton, U. S. Dept. of Agr.	1.50
Flax Culture	.30
The Forage and Fibre Crops, T. F. Hunt	1.75
Text Book on Forage Crops, C. V. Piper, U. S. Dept. of Agr.	1.75
Forage Crops, E. B. Voorhees, ex-Director N. J. Agr. Exp. Sta	1.50
Forage Crops Other Than Grasses, Thomas Shaw	1.00
Grasses and How to Grow Them, Thomas Shaw	1.50
How Crops Feed, S. W. Johnson	1.50
How Crops Grow, S. W. Johnson	1.50
Peas and Pea Culture, G. C. Levey	.50
The Potato, E. H. Grubb	$ 2.00
Small Grains, M. A. Carleton, Cerealist of U. S. Dept. of Agr., in prepr.	
Southern Field Crops, J. F. Duggar, Director Ala. Exp. Sta	1.75
Spraying Crops, C. M. Weed	.50
Soiling Crops and the Silo, Thomas Shaw	1.50
Story of a Grain of Wheat, W. C. Edgar	1.10
Sugar-Beet, L. S. Ware	3.50
Wheat Culture, D. S. Curtis	.50
The Book of Wheat, P. T. Dondlinger	2.00

SOIL PHYSICS.

Physics of Agriculture, F. H. King	1.75
Physical Properties of the Soil, Robert Warrington	1.50
Physical Properties of Soils, A. G. McCall	.50
Principles of Soil Management, T. L. Lyon and E. O. Fippin, Cornell	1.75
Rocks, Rock-Weathering and Soils, G. P. Merrill, Head Curator Geology, U. S. Nat. Museum	4.00
Soil Culture Manual, H. W. Campbell	2.50
Soils: Their Formation, Properties, Composition, Etc., E. W. Hilgard, Emeritus Prof. Agr., Univ. of Cal	4.00
The Soil: Its Nature, Relations, and Fundamental Principles of Management, F. H. King, formerly Prof. Agr. Physics, Univ. of Wis.	1.50
Soil Physics Laboratory Manual, J. G. Mosier and A. F. Gustafson, Univ. of Ill.	.60
Soil Physics Laboratory Guide, Stevenson and Schaub	.50
Soil and Crops of the Farm, G. E. Morrow and T. F. Hunt	1.00
Soil of the Farm, The, John Scott and J. C. Morton	1.00
Soil Management, F. H. King	1.50

DRY FARMING AND IRRIGATION

	Net.
Dry Farming, John Widtsoe, Pres. Agr. Coll. Utah	$ 1.50
The Conquest of Arid America, W. E. Smythe	1.50
Dry Farming, William Macdonald	1.20
Arid Agriculture, B. C. Buffum	1.50
Irrigation, John Widtsoe	1.75
Irrigation and Drainage, King	$ 1.50
Irrigation Farming, L. M. Wilcox	2.00
Irrigation for Farm Gardening Orchard, Henry Stewart	1.00
Irrigation Institutions, Elwood Mead, U. S. Dept. Agr	1.25

ANIMAL HUSBANDRY

GENERAL.

	Net.
Animal Competitors, Ingersoll	$ 1.00
Cattle, Sheep and Pigs: Their Practical Breeding and Keeping, F. T. Barton	3.00
Cyclopedia of Live Stock, Farmer's, Wilcox and Smith	4.50
Domesticated Animals and Plants, Eugene Davenport, Dean Coll. Agr., Univ. of Ill.	1.25
Farmer's Cyclopedia of Live Stock, E. V. Wilcox and C. B. Smith	4.50
Farm Animals, E. V. Wilcox	$ 2.00
Farm Animals, E. V. Wilcox	2.00
Farm Live Stock of Great Britain, Robert Wallace	5.00
Judging Live Stock, J. A. Craig	1.50
Private Herd Register	2.00
Profitable Stock Raising, C. A. Shamel	1.50
Study of Breeds, The, Thomas Shaw	1.50
Types and Breeds of Farm Animals, C. S. Plumb, Prof. An. Husbandry, O. S. U.	2.00

ANIMAL HUSBANDRY—Continued

FEEDING.

	Net.
Beef Production, H. W. Mumford, Prof. An. Husbandry, Univ. of Ill.	$ 1.50
Cattle Feeding with Beets, Ware.	2.50
Elementary Treatise on Stock Feeds, J. E. Halligan, Chemist, La. St. Exp. Sta.	2.50
Feeding Animals, E. W. Stewart.	2.00
Feeding Farm Animals, Thomas Shaw.	2.00
Feeding of Animals, The, W. H. Jordan, Director N. Y. Agr. Exp. Sta.	1.50
Feeding of Crops and Stock, Hall.	1.50
First Principles of Feeding Farm Animals, C. W. Burkett.	1.50
Feeds and Feeding, W. A. Henry, formerly Dean Coll. Agr. Wis., Madison, Wis.	2.25
Little Sketches of Famous Beef Cattle, Plumb	.60
Management and Feeding of Cattle, The, Thomas Shaw.	2.00
Principles of Animal Nutrition, The, H. P. Armsby, Director Pa. St. Agr. Exp. Sta.	4.00
Productive Feeding of Farm Animals, Woll	1.50
Profitable Stock Feeding, H. R. Smith.	1.50
Silos, Ensilage and Silage, Manly Miles.	.50

HORSES.

American Gentleman's Stable Guide, R. McClure	1.00
American Horses and Horse Breeding, John Dimon	3.50
American Thoroughbred, The, C. E. Trevathan	2.00
American Trotting and Pacing Horse, The, H. T. Coats	.75
Art of Horseshoeing, The, William Hunting	1.00
Breaking and Training of Horses, The, M. W. Harper, Asst. Prof. An. Husbandry, Cornell	1.75
American Reformed Horse Book, G. H. Dadd	2.00
Family Horse, The, G. A. Martin.	1.00
First Hand Bits of Stable Lore, F. M. Ware	2.00
Hints to Horse Keepers, H. W. Herbert.	1.50
Horses and Practical Horse Keeping, F. T. Barton	3.50
Horse, The, I. P. Roberts, Emeritus Prof. Agr., Cornell.	1.25
Horse, The, David Buffum.	1.50
Horse, The, William Youatt.	1.00
Horse, The, F. T. Barton.	1.00
Horse in America, The, J. G. Speed.	2.00
Horse Book, The, J. H. S. Johnstone.	2.00
Horse, The, How to Buy and Sell, Peter Howden	1.00
Horse, in the Stable and in the Field, The, Stonehenge	1.00
Horses, Horsemen and Stable Management, Godfrey Bosville.	2.00
Horse Sense, Dr. Curryer.	1.00
Horses' Teeth, Clarke.	2.50
How to Judge a Horse, F. W. Bach.	1.00
Management and Breeding of Horses, M. W. Harper	2.00
Percheron Horse, The, M. C. Weld.	.50
Practical Horse Keeper, The, George Fleming	$0.75
Productive Horse Husbandry, C. W. Gay, Prof. An. Husbandry, Univ. of Pa.	1.50
Riding and Driving, E. L. Anderson and Price Collier.	2.00
Saddle Horse, The.	1.00
Stallion Service Account Book, F. A. Glos	.80
Standard Horse Book, Wagner.	4.00
Standard Horse and Stock Book, Wagner.	2.00
Training and Breaking of Horses, Harper.	1.75
Training Trotting Horses, Charles Marvin	3.50
Trotting and Pacing Horse in America, The, Hamilton Busbey.	2.00
Trotting Horse in America, The, Hiram Woodruff	1.00
Youatt and Spooner on the Horse, H. S. Randall	1.00

POULTRY.

American Poultry Culture, R. B. Sando.	1.50
American Standard of Perfection.	2.00
Book of Pigeons, R. Fulton.	5.00
California Poultry Culture, Mrs. O. H. Burbridge	1.00
Capons and Caponizing, George Dow.	.50
Chicks, Hatching and Rearing, H. A. Nourse	.25
Common Sense in the Poultry Yard, J. P. Haig	1.00
Common Sense on Poultry Raising, Mrs. B. F. Wilcoxen.	.75
Diseases of Poultry, D. E. Salmon.	1.00
Egg Money and How to Increase It, H. A. Nourse	.25
Farm Poultry, G. C. Watson, ex-Prof. of Agr., Penn. State.	1.50
How to Keep Hens for Profit, C. S. Valentine	1.50
Incubation of Eggs, W. C. Schurman.	1.50
Illustrated Book of Domestic Poultry, Martin Doyle	2.50
Illustrated Standard of Perfection.	1.50
Kellerstrass Poultry House Plan Book.	2.50
Leghorns, The.	1.00
Perfected Poultry of America, T. F. McGrew and G. E. Howard.	2.50
Philosophy of Judging, Felch, Babcock and Lee	1.00
Plymouth Rocks, T. F. McGrew.	1.00
Poultry Feeding and Fattening, G. B. Fiske	.50
Poultry Architecture, G. B. Fiske.	.50
Poultry Appliances and Handicrafts, G. B. Fiske	.50
Poultry Laboratory Guide, H. R. Lewis, Prof. Poultry Husbandry, Baron de Hirsch Agr. College.	.65
Poultry Manual, The, F. L. Sewell and Ida E. Tillson.	.50
Poultry Houses, Coops and Equipment, H. A. Nourse.	.25
Poultry Text Books, F. C. Doolittle.	2.00
Poultry Keeping as an Industry, Edward Brown	2.00

ANIMAL HUSBANDRY—Continued

POULTRY—Continued.

	Net.
Poultry Foods and Feeding, Laurie Price..	$ 1.00
Poultry Culture, I. K. Felch	1.50
Poultry Breeding, Purvis	1.50
Poultry Book, The, Johnson and Brown	5.00
Poultry Book, The, Harrison Weir	1.50
Practical Poultry Keeper, Lewis Wright	1.25
Principles and Practice of Poultry Culture, J. H. Robinson, Editor Farm Poultry	2.50
Productive Poultry Husbandry, H. R. Lewis, N. J. Exp. Sta	2.00
Profitable Poultry Production, M. G. Kains	1.50
Progressive Poultry Culture, A. A. Brigham, Agr. Coll., Storrs, Conn	1.50
Races of Domestic Poultry, Edward Brown	2.00
Rachan's Poultry Directory	1.00
Rhode Island Reds, How to Breed and Judge Them, Theo. Hewes	1.00
Squabs for Profit, W. E. Rice and W. E. Cox	.50
Standard Wyandottes in Colors, and How to Judge Them, Theo. Hewes	1.00
Stearns' Model Poultry Account Book	2.00
Successful Poultry Culture, Clarence Ward	1.00
System in Poultry Practice, James Shackleton	1.00
Turkeys, Ducks and Geese, H. A. Nourse and G. H. Pollard	.50
Turkeys, How to Grow Them, Herbert Myrick	1.00
Wyandottes, The, J. H. Drevenstedt	1.00

SWINE.

Harris on the Pig, Joseph Harris	1.00
Hog Book, The, Dawson	1.50
Productive Swine Husbandry, G. E. Day, Prof. An. Husby., Ontario Agr. Coll	1.50
Swine Husbandry, F. D. Coburn	1.50
Swine in America, F. D. Coburn	2.50
Swine, William Dietrich, formerly of Univ. of Ill.	1.50

SHEEP—GOATS.

	Net.
The American Merino, Stephen Powers	$ 1.50
Management and Feeding of Sheep, Thomas Shaw	2.00
Modern Sheep, Breeds and Management, W. J. Clarke	1.50
Productive Sheep Husbandry, W. C. Coffey, Prof. Sheep Husbandry, Univ. of Ill., in prepr.	
Sheep Feeding and Farm Management, D. H. Doane, Prof. Farm Management, Univ. of Mo	1.00
Sheep Management, Frank Kleinheinz, Agr. Coll., Madison, Wis	1.50
Sheep and Their Diseases, W. A. Rushworth	1.50
Sheep Farming in America, J. E. Wing	1.00
Sheep Farming, Craig and Marshall	1.50
Sheep, The Domestic, Henry Stewart	1.50
Shepherd's Manual, Henry Stewart	1.00
Angora Goat Raising and Milch Goats, G. F. Thompson	1.00
Angora Goat, The, Shreiner	3.00
Raising Angora Goats, W. L. Black	3.00

BEES.

Advanced Bee Culture	1.25
Bee Keeper's Guide, The, A. J. Cook	1.25
Bee People, The, Margaret W. Morley	1.50
Fifty Years Among the Bees, Miller	1.00
Forty Years Among the Bees, C. C. Miller	1.00
Honey Bee, The, T. W. Cowan	1.00
Honey Makers, The, Margaret W. Morley	1.25
How to Keep Bees, A. B. Comstock	1.00
How to Keep Bees for Profit, D. E. Lyon	1.50
Langstroth on the Honey Bee, Dadant and Lon	1.25
Life of the Bee, Maurice Maeterlinck	1.40
Manual of the Apiary, A. J. Cook	1.30
Modern Bee Farm, S. Simmins	2.00
Mysteries of Bee Keeping Explained, Root	1.00
Quimby's New Bee Keeping, L. C. Root	1.00
Queen Rearing, G. M. Doolittle	1.00

VETERINARY SCIENCE AND PRACTICE

GENERAL.

	Net.
American Horse, Cattle and Sheep Doctor, McClure	$ 1.25
Animal Castration, A. Liautard	2.00
Care of Farm Animals, Mayo	1.50
Diseascs of Animals, The, N. S. Mayo	1.50
Diseases of Live Stock, Miller and Tellor	2.50
Farmers' Veterinary Adviser, James Law	3.00
Manual of the Practice of Veterinary Medicine	2.75
People's Horse, Cattle, Sheep and Swine Doctor	1.00
Veterinary Anatomy, Sisson	7.00
Veterinary Medicines, Dun	3.75
Veterinary Science, Hodgins and Haskett	2.00
Veterinary Studies, M. H. Reynolds	1.75

CATTLE.

	Net.
American Cattle Doctor, The, G. H. Dadd	$ 2.00
Bovine Obstetrics, De Bruin	5.00
Cattle Tuberculosis, Sessions	1.00

HORSES.

Exercises in Equine Surgery, Cadiot	2.50
Modern Horse Doctor, G. H. Dadd	1.00
Diseases of the Horse and How to Treat Them, R. Chawner	1.25
Manual of the Treatment of Lameness in the Horse, Chapman	2.00
Lameness of the Horse, W. E. A. Wyman	2.50

SHEEP—SWINE.

Sheep and Their Diseases, W. A. Rushworth	1.50
Diseases of Swine, D. McIntosh, Univ. of Ill	2.00
Diseases of Swine, R. A. Craig	.75

GENETICS

GENERAL.

	Net.
Origin of Species, Darwin	$ 2.00
Genetics, An Introduction to the Study of Heredity, H. E. Walter	1.50
Heredity; A Psychological Study, Ribot	2.00
Mendel's Principles of Heredity, Batcson	3.50
Mendelism, Punnett	1.25
Survival of the Unlike, The, L. H. Bailey, formerly of Cornell	2.00
Varieties in Animals and Plants, H. M. Vernon	1.75

ANIMALS.

Animal Breeding, Thomas Shaw	1.50
Breeding of Farm Animals, Marshall	1.50
Cattle Breeding, William Warfield	$ 2.00
Principles of Breeding, Eugene Davenport, Dean and Director Coll. Agr., Univ. of Ill.	2.50
Stock Breeding, Manly Miles	1.50
Study of Breeds, The, Thomas Shaw	1.50

PLANTS.

New Creations in Plant Life, W. S. Harwood	1.75
Evolution of Our Native Fruits, L. H. Bailey, formerly of Cornell	2.00
Origin of Cultivated Plants, A. DeCandoll	2.00
Plant Breeding, L. H. Bailey	1.25

AGRICULTURAL ENGINEERING

BUILDINGS.

	Net.
Barn Plans, William Radford	$ 1.00
Barn Plans and Out Buildings, E. C. Powell	1.00
Farm Buildings, Breeder's Gazette	2.00
Farm Buildings, J. S. Scott	.80
Farm Structures, K. J. T. Ekblaw, Associate in Farm Buildings, Univ. of Ill	1.75

DRAINAGE.

Engineering for Land Drainage, C. G. Elliott	2.00
Draining for Profit and Draining for Health, G. E. Waring, Jr	1.00
Farm Drainage, Judge French, New Hampshire	1.00
Land Draining, Manly Miles	1.00

FARM ENGINES.

Farm Gas Engines, H. R. Brate	1.00
Gas Engines for the Farm, C. F. Hirshfield and T. C. Ulbricht	1.50
Gas Engine, The, A. H. Goldingham	1.50
Gasoline Engine on the Farm, Z. W. Putnam	2.50
Gas Engine Troubles and Remedies, A. Stritmatter	1.00
Farm Engines and How to Run Them, J. H. Stephenson	1.00
Modern Gas Tractor, V. W. Page	2.00
Traction Farming and Traction Engineering, J. H. Stephenson	1.50

MECHANICS.

	Net.
Standard Blacksmithing, Horseshoeing and Wagon Making, J. G. Holmstrom	$ 1.00
Farm Blacksmithing, John Drew, School of Agr., Univ. of Minn	.50
Electricity in Agriculture and Horticulture, S. Lemstrom	1.50
Electricity on the Farm, F. M. Conlee	.75
Electric Light for Country Houses, Knight	.50
Electricity for the Farm and Home, Frank Koester	1.00
Electric Light for the Farm, Schneider	1.00
Electric Bells, How to Make and Fix Them, P. N. Hasluck	.50
Harness Making, P. N. Hasluck	.50
Knotting and Splicing, P. N. Hasluck	.50
Farm Machinery and Farm Motors, Davidson and Chase	2.00
Wind Mills and Wind Motors, F. E. Powell	.50
Farm Mechanic, The, G. E. Emberley	1.00
Power and the Plow, L. W. Ellis and E. A. Rumely	1.50
Portland Cement, R. K. Meade, Gen. Mgr. Tidewater Portland Cement Co	4.50
Reinforced Concrete in Europe, A. L. Colby	3.50
Silos: Construction and Service, M. L. King, formerly of Ia. St. Coll	.50
Domestic Water Supplies for the Farm, M. L. Fuller	1.50
Water Supply in Country Houses, C. J. Lynde	1.00

DAIRY HUSBANDRY

GENERAL AND CATTLE.

	Net.
American Dairying, H. B. Gurler	$ 1.00
Book of the Dairy, Fleischmann	4.00
Business of Dairying, The, C. B. Lane	1.25
Common Sense Ideas for Dairymen, G. H. Black	1.00
Dairy Technology, C. Larsen, S. Dak. Agr. Coll., and William White, Manhattan, Kan.	1.50
Dairying Industry, Thompson	4.00
Dairying, Milk, Cheese and Butter, John Oliver	3.00
Dairymen's Manual, Henry Stewart	1.50
Farm and the Dairy, J. P. Sheldon, Special Commissioner, Canadian Govt	1.00
Farm Dairy, The, H. B. Gurler	1.00
Farm Dairying, Laura Rose	1.25
Farm Dairying, Michels	$ 1.00
First Lessons in Dairying, H. E. VanNorman	.50
Guenon's Treatise on Milch Cows, T. J. Hand	1.00
Handbook for Farmers and Dairymen, A, F. W. Woll	1.50
Jersey, Alderney, Guernsey Cows, W. P. Hazard	1.00
Market Dairying, John Michels	1.50
Management and Feeding of Cattle, Thomas Shaw	2.00
Modern Dairy Farming, Puxley	1.50
Principles of Modern Dairy Practice, The, Gösta Grotenfelt, Pres. Mustiala Agr. Coll., Finland, Am. Edition, F. W. Woll.	2.00
Profitable Dairying, C. L. Peck	.75

DAIRY HUSBANDRY—Continued

BACTERIOLOGY—CHEMISTRY.

	Net.
Dairy Chemistry, H. D. Richmond	$ 4.25
Dairy Chemistry, Harry Snyder, formerly of St. Paul, Minn	1.00
Experimental Dairy Bacteriology, H. L. Russell and E. G. Hastings, Coll. Agr., Wis.	1.00
Practical Dairy Bacteriology, H. W. Conn.	1.25

MANUFACTURES—BUTTER—CHEESE.

Butter and Butter Making, W. F. Hazard.	.25
Cheese Making, Decker, Revised by F. W. Woll	1.75
Creamery Butter Making, Michels	1.00
Fancy Cheese in America, C. A. Publow	.75
Principles and Practice of Butter Making, G. L. McKay, formerly Ia. St. Coll., and C. Larsen, Prof. Dairy Husbandry, S. Dak.	1.50
Science and Practice of Cheese Making, Van Slyke and Publow	1.75

MILK, PRODUCTS—TESTING.

Analysis of Milk and Milk Products, Leffman	1.25
Clean Milk, S. D. Belcher	1.00
Condensed Milk and Milk Powder, O. F. Hunziker, Dairy Husbandry, Purdue	$ 5.00
Dairy Laboratory Guide, G. L. Martin	.50
Dairy Laboratory Guide, A, H. E. Ross	.50
Dairy Cattle and Milk Production, C. H. Eckles, Prof. Dairy Husbandry, Univ. of Mo.	1.60
Essentials in Milk Hygiene, C. O. Jensen and Leonard Pearson	2.00
Milk: Its Nature and Composition, C. M. Aikman	1.25
Milk: Its Production and Uses, E. F. Willoughby	2.00
Milk Question, The, Roseman	2.00
Milk and Its Products, H. H. Wing, Prof. An. Husbandry, Cornell	1.50
Milk and Dairy Products, Chr. Barthel	1.90
Modern Methods of Testing Milk, L. L. Van Slyke	1.00
Pasteurization and Milk Preservation, J. H. Monard	.50
Production and Handling of Clean Milk, Winslow and Hill	3.25
Testing Milk and Its Products, Farrington and Woll	1.00
Testing Milk and Milk Products, L. L. Van Slyke	.75

HORTICULTURE

FRUITS.

	Net.
American Horticultural Manual, J. L. Budd, formerly Ia. St. Coll., and N. E. Hansen, S. Dak. Agr. Coll. 2 parts...Each	$ 1.50
American Fruit Culturist, J. J. Thomas	2.50
Apple Orchard, The American, F. A. Waugh	1.00
Apple Culture, Field Notes on, L. H. Bailey, Jr.	.75
Budding and Grafting, C. B. Battel	1.00
Bush Fruits, F. W. Card, formerly Rhode Island Coll. Agr. and Mechanic Arts	1.50
Citrus Fruits and Their Culture, H. H. Hume	2.50
Cider Maker's Handbook, J. M. Trowbridge	1.00
Cranberry Culture, J. J. White	1.00
Cape Cod Cranberries, James Webb	.40
Foundations of American Grape Culture, T. V. Munson	2.00
Fruit Culturist, American, J. J. Thomas	2.50
Fruit Culture, Successful, S. T. Maynard.	1.00
Fruit Culturist, Small, J. J. White	1.00
Fruit Culturist, Small, A. S. Fuller	1.00
Fruit Garden, Barry's, P. Barry	1.50
Fruit Grower, Practical, S. T. Maynard	.50
Fruit Growing in Arid Regions, Wendell Paddock, Prof. Horticulture, O. S. U., and O. B. Whipple, Colo. Agr. Coll	1.50
Fruit Trees, Dwarf, F. A. Waugh	.50
Fruit Harvesting, Storing, Marketing, F. A. Waugh	1.00
Fruit Growing, Lessons in, Commercial, E. S. Goff	1.00
Fruit Garden, How to Make a, S. W. Fletcher	2.00
Fruit Growing, Popular, S. B. Green, formerly of Univ. of Minn., and LeRoy Cady, Univ. of Minn	1.00
Fruits and How to Raise Them, H. Harcourt	$ 1.00
Fruits and How to Grow Them, E. J. Wickson	3.25
Fruits, How to Know Wild, M. G. Peterson	1.50
Forcing-Book, The, L. H. Bailey, formerly of Cornell	1.25
Grape Culturist, A. S. Fuller	1.50
Grape Culture, Foundation of, American, T. V. Munson	3.00
Grape Grower's Guide, William Chorlton	.75
Grape Growing and Wine Making, G. Husmann	1.50
Handbook of Plants and General Horticulture, Peter Henderson	3.00
Hardy Garden, A Woman's, Helena R. Ely	1.75
Hardy Garden Book, Another, Helena R. Ely	1.75
Nut Culturist, The, A. S. Fuller	1.50
Nursery Book, The, L. H. Bailey	1.50
Orchard and Fruit Garden, E. P. Powell	1.27
Peach Culture, J. A. Fulton	1.00
Peach Orchard, The American, F. A. Waugh	1.00
Pear Culture for Profit, P. T. Quinn	1.00
Pecan and Its Culture, The, H. H. Hume	1.00
Peanut Plant, The: Its Cultivation and Uses, B. W. Jones	.50
Plums and Plum Culture, F. A. Waugh	1.50
Pomology, Systematic, F. A. Waugh	1.00
Pruning Book, The, L. H. Bailey	1.50
Productive Orcharding, F. C. Sears	1.50
Propagation of Plants, The, A. S. Fuller	1.50
Quince Culture, W. W. Meech	1.00
Strawberry Growing, Modern, A. E. Wilkinson	1.10
Strawberry Culturist, A. S. Fuller	.75

HORTICULTURE—Continued

GREENHOUSES.

	Net.
Greenhouse Construction, L. R. Taft	$ 1.50
Greenhouse Construction and Heating, B. C. Ravenscroff	1.50
Greenhouse Management, L. R. Taft	1.50

VEGETABLES.

Asparagus Culture, James Barnes and William Robinson	.50
Asparagus, Book on, Charles Ilott	1.00
Bean Culture, G. C. Sevey	.50
Celery Culture, W. R. Beattie	.50
Celery, Kalamazoo Culture of, G. Von Bochone	.50
Commercial Gardening, By many practical specialists under editorship of John Weathers. 4 quarto volumes	15.00
Dictionary of Gardening, Nicholson. 5 vols.	29.00
Farm and Garden Rule Book, L. H. Bailey	2.00
Farm Gardening and Seed Growing, Francis Brill	1.00
Garden Farming, Lee, Cleavel and Corbett, U. S. Dept. Agr	2.00
Garden Week by Week, The, W. P. Wright	2.00
Gardening in California, John McLaren	1.75
Gardening for Profit, Peter Henderson	1.50
Gardening for the South, P. H. Mill	2.50
Ginseng, M. G. Kains	.50
Ginseng and Other Medicinal Plants, A. R. Harding	1.00
How to Make a Vegetable Garden, Edith Fullerton	2.00
How to Grow Vegetables, Allen French	1.75
How to Grow Vegetables and Garden Herbs, Allen French	1.75
Manual of Gardening, L. H. Bailey	2.00
Market Gardening and Farm Notes, Burnett Landreth	1.00
Melon Culture, J. Troop	$ 0.50
Mushrooms: How to Grow Them, William Falconer	1.00
Mushroom Book, The, Nina L. Marshall	3.25
Mushroom Culture, W. Robinson	.50
Mushrooms, G. E. Atkinson	3.25
Mushroom Handbook, E. L. Lathrop	1.00
Mushrooms in America, Taylor	3.00
New Standard Cyclopedia of Horticulture, The, L. H. Bailey. 6 vols. Each	6.00
Onion Culture, The New, T. Greiver	.50
Potato, Fraser	.75
Practical Garden Book, The, L. H. Bailey and C. E. Hunn	1.00
Principles of Vegetable Gardening, The, L. H. Bailey	1.50
Productive Vegetable Growing, J. W. Lloyd, Univ. of Ill	1.50
Propagation of Plants, The, A. S. Fuller	1.50
Rhubarb Culture, The New, J. E. Morse	.50
Seed Grower, The, Charles Johnson	1.25
Southern Gardener's Practical Manual, J. S. Newman	1.00
Spraying of Plants, The, E. G. Lodeman, formerly of Cornell	1.25
Success in Market Gardening, H. W. Ranson	1.10
Sweet Potato Culture, James Fitz	.50
Tomato Culture, W. W. Tracy	.50
Tomato Culture, Day, Cummins and Root	.40
Truck Farming in the South, A. Oemler	1.00
Vegetable Gardening, S. B. Green, formerly of Univ. of Minn	1.00
Vegetable Garden, The, Ida D. Bennett	1.50
Vegetable Gardening, Watts	1.75

FORESTRY

	Net.
Among Green Trees, J. E. Rogers	$ 3.25
Economics of Forestry, B. E. Fernow	1.50
Evergreens, and How to Grow Them, C. S. Harrison	.50
Farm Forestry, Alfred Akerman	.50
Farm Forestry, Cheyney	1.50
First Book of Forestry, Filibert Roth	.75
Forest Mensuration, H. S. Graves, Chief Forester, U. S. Dept. Agr	4.00
Forest Physiography, Isaiah Bowman, Asst. Prof. Geology, Yale	5.00
Forest Planting, H. Nicholas Jarchow	1.50
Forestry in New England, R. C. Hawley, Asst. Prof. Forestry, Yale, and A. F. Hawes, State Forester, Vermont	3.50
Getting Acquainted With the Trees, J. H. McFarland, Pres. Am. Civic Service Asso.	1.50
Handbook of Trees in the Northern States and Canada, R. B. Hough	10.00
Identification of the Economic Woods of the U. S., S. J. Record	1.25
Important Timber Trees of the U. S., Elliott	2.50
In American Fields and Forests	1.50
Logging, R. C. Bryant	3.50
Long-Leaf Pine in Virgin Forest, The, G. F. Schwarz	1.25
Manual of Forestry, A. William Schlick, 5 vols.	19.00
Manual of Trees, A, C. S. Sargent	$ 6.25
Maple Sugar and Sugar Bush, C. Cook	.35
North American Forests and Forestry, Ernest Brunken	2.00
Our Native Trees and How to Identify Them, Harriet L. Keeler	2.00
Practical Forestry, A. S. Fuller	1.50
Practical Forestry, John Gifford	1.25
Principles of American Forestry, S. B. Green	1.50
The Farm Woodlot, E. G. Cheyney, Dept. Forestry, Univ. of Minn	1.50
The Principles of Handling Woodlands, H. S. Graves, Chief Forester, U. S. Dept. Agr.	1.50
Theory and Practice of Working Plans of Forest Organization, A. B. Recknagel	2.00
Timber and Some of Its Diseases, H. M. Ward	1.75
Tree Book, The, Julia E. Rogers	4.25
Tree Doctor, The, John Daney	2.00
Trees and Shrubs, C. S. Sargent. In 4 parts, 4 in 1 Vol.	21.00
Trees and Shrubs of Northeastern North America, C. S. Newhall	2.00
Trees and Tree Planting, J. S. Brisbin	1.50
Trees in Winter, A. F. Blakeslee and C. D. Jarvis	2.00
Trees of the Northern U. S., A. C. Apgar	1.00
White Pine, The, A Study, Pinchot and Graves	1.00

LANDSCAPE GARDENING AND FLORICULTURE

FLORICULTURE.

	Net.
American Flower Garden, The, Neltje Blanchan	$ 1.50
Flower Decoration in the House, Gertrude Jekyll	2.00
Home Decoration, E. E. Rexford	1.00
Home Floriculture, E. E. Rexford	1.00
Home Floriculture, C. N. Page	.75
Parsons on the Rose, S. B. Parsons	1.00
Popular Garden Flowers, W. P. Wright	2.50
Practical Floriculture, Peter Henderson	1.50
Practical Flower Garden, The, Helena R. Ely	2.00
Roses in Pots, The Cultivation of, William Paul	1.00
Roses, A Book About, Dean S. R. Hole	1.25
Rose Book, The Amateur Gardener's, Julius Hoffman	2.75
Rose, The, H. B. Ellwanger	1.25
Sweet Peas, N. H. Pearson	.30
Window Gardening, H. B. Dorner, Prof. Floriculture, U. of Ill	1.00

LANDSCAPE GARDENING.

Art of Landscape Gardening, The, H. R. Price	3.00
Beautifying Country Homes, J. Weidemann	10.00
Country Residences in Europe and America, L. V. LeMoyne	8.00
Farm Windbreaks and Shelter Belts, S. B. Green, late Prof. of Hort., Univ. of Minn.	.25
Formal Garden in England, The, R. Blomfield	3.15
Garden Making: Suggestions for the Utilizing of Home Grounds, L. H. Bailey and others	1.50
Gardens of England, The, Beatrice Parsons	2.50
Hardy Plants for Cottage Gardens, Helen R. Albee	1.60
How to Lay Out Suburban Home Grounds, H. T. Kellaway	2.00
How to Plan the Home Gardens, Samuel Parsons, Jr.	1.00
Landscape Gardening, Edward Kemp	1.50
Landscape Gardening as Applied to Home Decoration, S. T. Maynard, formerly of Mass. Agr. Coll	1.50
Landscape Beautiful, The, F. A. Waugh	2.00
Landscape Gardening Book, The, Grace Tabor	2.00
Landscape Gardening, F. A. Waugh	.75
Lawns and How to Make Them, Leonard Barron	1.00
New Gardening, W. P. Wright	2.00
Ornamental Shrubs of the U. S., A. C. Apgar	1.50
Ornamental Gardening for Americans, E. A. Long	1.50
Our Native Shrubs and How to Identify Them, Harriet L. Keeler	2.00
Plea for Hardy Plants, J. W. Elliott	1.75
Residential Sites and Environments, J. F. Johnson	2.50
School and Home Gardens, W. H. D. Meier, St. Normal School, Framingham, Mass.	.80
Shade-Trees in Towns and Cities, William Solotaroff, Sec. and Supt. Shade-Tree Commission, East Orango, N. J.	3.00
Trees in Lawn, Street and Park, The Care of, B. D. Fernow	2.00
What England Can Teach Us About Gardening, Dr. Wilhelm Miller	4.00
Yard and Garden, Tarkington Baker	2.00

ENTOMOLOGY

	Net.
A Manual for the Study of Insects, J. H. Comstock	$ 3.60
American Insects, V. L. Kellogg	5.00
Economic Entomology, Smith	2.50
Elementary Entomology, E. D. Sanderson, Dean Coll. Agr. W. Va. Univ., and C. F. Jackson, Prof. Zoology, New Hampshire Coll.	2.00
Fumigation Methods, W. G. Johnson	1.00
Fruit Insects, M. V. Slingerland and C. R. Crosby	2.00
Guide to the Study of Insects, A. S. Packard	5.00
Injurious Insects and the Use of Insecticides, F. W. Sempers	.40
Injurious Insects: How to Recognize and Control Them, W. C. O'Kane	$ 2.00
Injurious Insects of the Farm and Garden, Mrs. Mary Treat	1.50
Insects and Insecticides, C. M. Wood, Prof. Ent. and Zoology, N. H. Coll. Agr.	1.50
Insect Book, The, L. O. Howard	3.25
Insects Injurious to Staple Crops, E. D. Sanderson	1.50
Insects Injurious to Vegetables, F. H. Chittenden	1.50
Insect Life, J. H. Comstock	1.75
Insect Pests of Farm, Garden, and Orchard, E. D. Sanderson	3.00

BACTERIOLOGY AND PLANT DISEASES

	Net.
Agricultural Bacteriology, H. W. Conn	$ 2.00
Agricultural Bacteriology, Russell and Hastings	1.25
Bacteria in Relation to Plant Diseases, Edwin S. Smith	4.00
Bacteria in Relation to Country Life, Jacob G. Lipman, N. J. Exp. Sta	1.50
Diseases of Cultivated Plants and Trees, George Massee, Asst. Keeper, Herbarium Royal Botanic Gardens, Kensington, Eng.	2.25
Diseases of Economic Plants, F. L. Stevens and J. G. Hill	2.00
Diseases of Plants, K. F. Von Tubeuf	$ 5.50
Diseases in Plants, H. M. Ward	1.75
Fungi Which Cause Plant Disease, The, F. L. Stevens, Prof. Vegetable Pathology, Univ. of Ill	4.00
Fungous Diseases of Plants, B. M. Duggar, Prof. Plant Phys., Cornell	2.00
Insects Injurious to Fruits, William Saunders	2.00
Life Histories of American Insects, Weed	1.50
Manual of Bacteriology, Muir and Ritchie	4.00
Plant Physiology With Special Reference to Plant Production, B. M. Duggar	1.60

HOUSEHOLD SCIENCE AND ARTS

GENERAL.

	Net.
Bacteria, Yeasts, and Molds in the Home, H. W. Conn, Prof. Bacteriology, Wesleyan Univ.	$ 1.00
Basic Principles of Domestic Science, Lilla Frich, Domestic Science Dept., Minn. Public Schools	1.50
Common Sense in the Household, Marion Harland	1.50
Domestic Science, Ida Hood Clark	1.00
Household Bacteriology, R. E. Buchanan and Estelle D. Buchanan	2.25
Household Chemistry, H. T. Vulte, Columbia Univ., and G. A. Goodell, Wellesley College	1.25
Household Science, Juniata L. Shepperd, Univ. of Minn	1.75
Manual of Bacteriology, A, for Agr. and Dom. Sci. Students, H. S. Reed, Va. Polytechnic Inst.	1.25
Principles of Human Nutrition, W. H. Jordan. N. Y. Agr. Exp. Sta	1.75

FOODS AND THEIR PREPARATION.

Breadmaking Chemistry, J. Grant	1.40
Canning and Preserving, Mrs. Rorer	.50
Cook Book, Century, Mary Ronald	2.00
Cook Book, Boston Cooking School, Fannie Farmer	2.00
Cook Book, Fireless, Margaret J. Mitchell	1.25
Cook Book, Vegetarian, Fulton	1.00
Cook Book, Home Science, Lincoln and Barrows	1.00
Cook Book, Complete, Marion Harland	2.00
Cook Book, The Winston, Helen Cramp, Univ. of Chicago	1.35
Cook Book, The Country Kitchen, many contributors	.50
Cooking for Two, Janet Hill	1.50
Detection of Common Food Adulterants, E. M. Bruce	1.25
Foods and Their Adulteration, H. W. Wiley	4.00
Food and Nutrition, The Chemistry of, H. C. Sherman	1.50
Foods: Their Composition and Analysis, A. and M. Blyth	7.50
Foods, Pure. Adulteration, Nutritive Value and Cost, J. C. Olsen, Polytechnic Inst., Brooklyn, N. Y.	.80
Foods and Feeding, Henry Thompson	1.35
Fruit Recipes, Ida M. F. Berry	1.50
Left-Overs Made Palatable, Isabel G. Curtis	1.00
Manufacture of Preserved Food and Sweetmeats, A. Hausner	$ 3.00
Recipes for the Preserving of Fruit, Vegetables and Meat, Wagner	2.50
Theory and Practice of Cookery, Williams and Fisher	1.00
Things Mother Used to Make, Lydia Maria Gurney	.50
What to Have for Luncheon, Mary J. Lincoln	1.25

ARTS.

From Kitchen to Garret, Virginia T. VandeWater	1.00
Home Nursing, Eveleen Harrison	1.00
Home Lace-Making, Milroy	1.00
Household Textiles, Charlotte M. Gibbs (Baker), formerly Univ. of Ill	1.25
Laundry Work, Juniata L. Shepperd	.60
Textiles and Clothing, Watson	1.50

HOMES.

Complete Etiquette, Marion Harland	1.00
Cottage Houses, With Complete Plans and Specifications, S. B. Reed	1.00
Distinctive Homes of Moderate Cost, H. H. Saylor	2.00
Farm Sewage, Dr. Santee	.50
Handbook of Home Economics, Flagg	.75
Home Economics, Maria Parloa	1.50
Housekeepers' Week, The, Marion Harland	1.50
Homes for Home Builders, W. D. King	1.00
Houses for Town or Country, William Herbert	2.00
How to Build a Home, F. C. Moore	1.00
Guide to the Country Home, E. K. Parkinson	1.00
Modern Household, Talbot and Breckenbridge	1.00
Modern House Plans for Everybody, S. B. Reed	1.00
Neighborhood Entertainments, Renee B. Stern	1.00
Principles of Home Decoration, Candace Wheeler	2.00
Progress in the Household, Lucy M. Salmon, Vassar College	1.10
Sanitation of a Country House, Bashore.	1.00
Self-Supporting Home, A, Kate V. St. Maur	1.75
Ventilation for Dwellings, Rural Schools and Stables, F. H. King	.75

RURAL SOCIOLOGY

	Net.
Chapters in Rural Progress, Butterfield	$ 1.10
Constructive Rural Sociology, J. M. Gillette, Prof. Sociology, Univ. of N. Dak.	1.60
Country Church and the Rural Problem, Butterfield	1.00
How to Live in the Country, E. P. Powell	$ 1.75
Report of the Country Life Commission	1.00
The Country-Life Movement, L. H. Bailey	1.25
The Rural Life Problem of the U. S., Sir Horace Plunkett	1.25

SECONDARY AGRICULTURE

GENERAL.

	Net.
Agricultural Engineering, J. B. Davidson, Prof. Agr. Engineering, Iowa St. Coll...	$ 1.50
Agriculture, Soule and Turpin.....	.75
Agriculture for Beginners, Burkett, Stevens and Hill	.75
Agriculture for Common Schools, M. L. Fisher, Purdue, and F. A. Cotton.....	1.00
Agriculture for Schools on the Pacific Slope, E. W. Hilgard, Emeritus Prof. Agr., Univ. of Cal., and W. J. V. Osterhout, Asst. Prof. of Botany, Harvard..	1.00
Agriculture for Southern Schools, J. F. Duggar, Director Alabama Agr. Exp. Sta.	.75
Agriculture Through the Laboratory and School Garden, Jackson and Daugherty	1.50
Agriculture for Young Folks, A. P. Wilson, Supt. Farmers' Inst. and Agr. Ext., Univ. of Minn., and E. W. Wilson....	1.00
Beginnings in Agriculture, A. R. Mann..	.75
Catechism of Agriculture, T. C. Atkeson..	.50
Elementary Principles of Scientific Agriculture, N. T. Lupton, formerly of Vanderbilt Univ., Nashville, Tenn.....	.35
Elements of Agriculture, G. F. Warren, Prof. Farm Management, Cornell.....	1.10
Elements of Agriculture, Southern and Western, W. C. Welborn, Vice-Director, Texas Exp. Sta.....	.75
Elements of Agriculture, J. H. Shepperd, Dean Agr. Dept. N. Dak. Agr. Coll., and J. C. McDonnell, U. S. Dept. Agr.....	1.00
Farm Arithmetic, Shutts and Weir, in prepr.	
Farm Arithmetic, C. W. Burkett and K. D. Swartzel	1.00
Farm Friends and Farm Foes, C. M. Weed, St. Normal School, Lowell, Mass.....	.90
First Principles of Agriculture, E. S. Goff, late Prof. of Horticulture, Univ. of Wis., and D. D. Mayne, Sch. of Agr., Univ. of Minn.	.80
First Book of Farming, C. L. Goodrich..	1.00
Fundamentals of Agriculture, J. E. Halligan, La. State Univ. Exp. Sta.....	1.25
Fundamentals of Farming and Farm Life, Kyle and Ellis, Texas Agr. Coll.....	1.25
General Agriculture, A. D. and E. W. Wilson	1.00
High School Agriculture, D. D. Mayne, Univ. of Minn., and K. L. Hatch, Univ. of Wis.	1.00
High School Agriculture, several authors. In prepr.	
Introduction to Agriculture, A. A. Upham	.75
Manual of Agriculture, D. O. Barto, Univ. of Ill.	.50
Manual of Agr. for Secondary Schools, Call and Shafer	.90
Our Farming, Terrey	$ 1.00
Practical Lessons in Agr., L. S. Ivins, State Supervisor Agr. Ed., O., and F. A. Merrill, State Normal School, Athens, Ga. In prepr.	
Practical Agriculture, J. W. Wilkinson, Supervisor of Agr., San Diego, Cal....	1.00
Principles of Agr., The, L. H. Bailey....	1.25
Principles of Agr., I. O. Winslow.....	.60
Principles of Agriculture Through the School and the Home Garden, The, C. A. Stebbins	1.00
Productive Farming, K. C. Davis, N. J. Coll. Agr.	1.00
Rural School Agriculture, C. M. Davis...	1.00
School Agriculture, M. N. Wood.....	.90
Text Book of Southern Agriculture, F. S. Earle	1.25
Text Book of Tropical America, A, H. A. Nichols, Senior Medical Officer, Dominica, West Indies	1.30
Teaching of Agriculture in the High Schools, G. A. Bricker.....	1.00

RURAL EDUCATION.

Farm Boys and Girls, W. A. McKeener, Prof. of Child Welfare, Univ. of Kans.	1.50
Improvement of Rural Schools, E. P. Cubberley, Leland Stanford Univ.....	.35
New Ideas in Rural Schools, G. H. Betts, Prof. Psy., Cornell Coll.....	.60
New Methods in Education, J. L. Todd....	2.00
Rural Life and Education, E. P. Cubberley	1.50

DOMESTIC SCIENCE.

Elementary Domestic Science, Sarah Landes	.8
A New and Practical Sewing Course, Margaret J. Blair.....	.5
Domestic Science—Principles and Application, Pearl L. Bailey, Sup. of Dom. Sci., St. Paul	1.0

HEALTH.

Health on the Farm, H. F. Harris.....	1.0
Malaria: Cause and Control, W. B. Herms	1.5
Rural Hygiene, Poore	2.0
Rural Hygiene, H. N. Ogden, Prof. Sanitary Engineering, Cornell.....	1.5

ANIMALS.

Animals, N. L. Kellogg.....	1.8
Animal Studies, D. S. Jordan.....	1.2
Beginnings in Animal Husbandry, C. S. Plumb, Prof. An. Husby., O. St. Univ..	1.2
Birds That Every Child Should Know, Neltje Blanchan	1.2

SECONDARY AGRICULTURE—Continued

SOILS AND CROPS.

	Net.
Agronomy, Practical Gardening for High Schools, W. N. Clute	$ 1.00
The Corn Crops, E. G. Montgomery, Prof. Farm Crops, Cornell	1.60
Crop Production, C. M. Weed and W. E. Riley, St. Normal School, Lowell, Mass.	.80
Soils and Soil Fertility, A. R. Whitson and W. L. Walster, Univ. of Wis	1.25
Field Crop Production, George Livingston, Ohio St. Univ.	1.20
Soils and Crops—A Manual of Agriculture, D. O. Barto, Univ. of Ill	.50

PLANTS AND GARDENS.

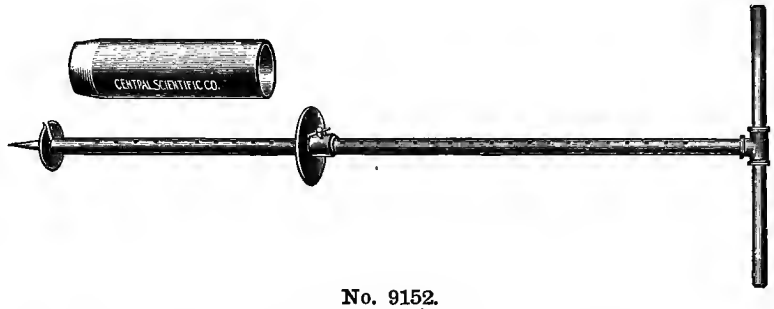
	Net.
Agricultural Botany, Percival	2.50
Amateur Fruit Growing, S. B. Green, late Prof. Hort., Univ. of Minn	.50
Beginner's Guide to Fruit Growing, F. A. Waugh	.75
Beginner's Garden Book, The, Allen French. In prepr.	
Fruit Culture for Amateurs, S. T. Wright	$ 1.50
Gardens and Their Meaning, Dora Williams, Teacher Boston Normal School	1.00
Gardening for Beginners, E. T. Cook	4.00
Guide to the Trees, Alice Lounsberry	1.90
Guide to the Wild Flowers, Alice Lounsberry	1.90
How to Know the Wild Flowers, Mrs. W. S. Dana	2.00
How to Make School Gardens, H. D. Hemenway	1.00
Laboratory and Field Manual of Botany, A, Bergen and Davis	.90
Nature Study: A Manual for Teachers and Students, F. L. Holtz	1.50
Nature Study Idea, The, L. H. Bailey	1.25
Plant Life and Plant Uses, J. G. Coulter	1.20
Studies of Trees in Winter, Annie O. Huntington	2.50

BIRDS

	Net.
Color Key to North American Birds, F. M. Chapman	$ 2.50
Field Book of American Wild Birds and Their Music, F. S. Mathews	2.00
Handbook of Birds of Eastern North America, F. M. Chapman	3.00
Handbook of the Birds of the Western United States, Florence Bailey	3.50
Michigan Bird Life (Bulletin), W. B. Barrows	$ 0.60
Our Common Birds and How to Know Them, J. B. Grant	1.50
Our Domestic Birds, J. H. Robinson, Editor Farm Poultry	1.35

MISCELLANEOUS

	Net.
Agriculture, W. P. Brooks. 3 vols. Each	$ 2.00
A Manual of Practical Farming, John McLennan, Supt. of Farms, N. Y. School of Agr.	1.50
A Treatise on Roads and Pavements, I. O. Baker, Univ. of Ill	5.00
Commercial Raw Materials, C. R. Toothaker, Curator Phila. Museums	1.25
Cyclopedia of American Agriculture, L. H. Bailey. 4 vols	32.00
Elementary Meteorology, W. M. Davis, Prof. Geology, Harvard	2.50
Farmer's Cyclopedia	20.00
Vol. I. Farm Animals, Etc.	
Vol. II. Diseases of Horses, Swine, Poultry.	
Vol. III. Diseases of Cattle, Sheep, Goats, Etc.	
Vol. IV. Grass, Hay, Grains, Vegetables.	
Vol. V. Fruits, Forests, Flowers, Cotton, Tobacco, Sugar Beets, Sugar Cane.	
Vol. VI. Plant Diseases, Etc.	
Vol. VII. Farming Methods, Soil Fertilizers, Irrigation, Rotation.	
Farmer's Cyclopedia of Agriculture, E. V. Wilcox and C. B. Smith	3.50
How to Choose a Farm, T. F. Hunt	$ 1.75
Poems of Country Life: A Modern Anthology, G. S. Bryan	1.00
Practical Exercises in Elementary Meteorology, R. D. Ward	1.12
Roads, Paths and Bridges, L. W. Page	1.00
Rural Wealth and Welfare, G. T. Fairchild, late Pres. Agr. Coll., Kansas	1.25
Small Country Place, The, S. T. Maynard	1.50
The Call of the Land, E. B. Andrews	1.50
The Conservation of Natural Resources in U. S., C. R. Van Hise, Pres. Univ. of Wis.	2.00
The Farmer of To-morrow, F. T. Anderson	1.50
The Farmstead, I. P. Roberts, Emeritus Prof. Agr. Cornell	1.50
The Fat of the Land, J. W. Streeter	1.50
The Outlook to Nature, L. H. Bailey	1.25
The Satisfaction of Country Life, J. W. Robertson	1.00
The State and the Farmer, L. H. Bailey	1.25
The World's Commercial Products, W. G. Freeman and S. E. Chandler	3.00
Tropical Agriculture, H. A. Nichols	1.30
Young Farmer, The: Some Things He Should Know, T. F. Hunt	1.50



No. 9152.

9152. **SOIL AUGER, Nebraska Design,** designed for general work in soil investigation; especially adapted to work where samples at exact depths are desired, since with this instrument it is possible to secure samples of soil one inch in thickness to a total depth of two feet. This type of auger has been used with satisfactory results by the Nebraska Agricultural Experiment Station in securing samples of soil for chemical analysis and soil moisture studies. The auger is also well adapted for use in making determinations of the apparent specific gravity of soils under field conditions, since a definite volume of soil may be removed without the necessity of digging around a tube and cutting the soil off even with the lower edge.

In use the auxiliary tube is driven into the soil to such a depth that when the auger blade is just resting on the surface of the soil, the adjustable gauge may be set in the first notch on the auger stem, and at the same time rest on the top of the tube. The gauge is then raised to the next notch and the auger turned until the gauge again comes in contact with the top of the tube, or, in other words, has removed one inch of soil, since the notches are one inch apart. In this manner, a sample of soil from each inch may be obtained from a depth of 2 feet. Complete with auxiliary tube..... $ 7.50

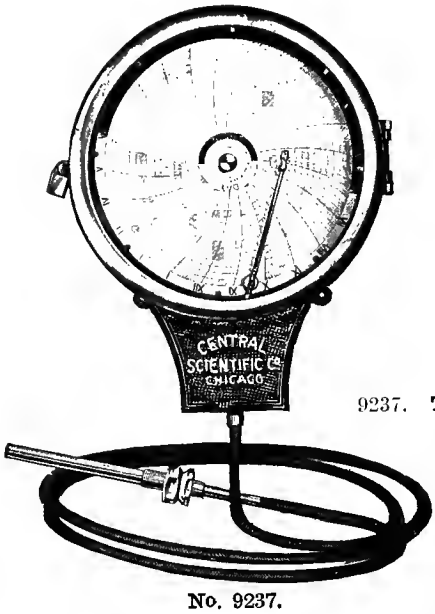
No. 9173.

No. 9198.

9173. **SOIL SAMPLER, Bacteriologist's,** after specifications by H. A. Noyes of the Purdue University Agricultural Experiment Station. This sampler is a brass cylinder 11 inches long by 2 inches in diameter, with an especially constructed cutting edge. The end having the cutting edge is furnished with a tight fitting brass cap 2 inches in height. When the upper end is plugged with absorbent cotton, the sampler is ready for sterilization. The sampler is easy to sterilize, easily kept clean, easy to use, and durable, and hence will be found valuable in bacteriological work. This apparatus will (1) sample accurately soil subjected to any system of management; (2) not interfere with the field conditions existing where the sample is taken, thus making future samples comparable; (3) give a representative sample of soil; and (4) keep the sample practically under field conditions until analyzed, since the tube itself acts as container for the sample. Graduated as shown in the illustration, and with directions for use.. 1.65

9173A. **DRIVING HEAD,** of cast iron, for use with No. 9173 Soil Sampler..... .30

9198. **SHRINKAGE APPARATUS,** for determining the shrinkage of soils, as described in Mosier and Gustafson's "Soil Physics Laboratory Manual," and used at the University of Illinois. This is a tray of brass, 3 inches square at the top, with beveled sides to facilitate removal of the soil sample. In use, a piece of cheese cloth is placed on the bottom of the tray, which is then filled with moist soil. The soil block is then removed from the tray and allowed to dry. The shrinkage in area may readily be determined by measurement..... .50



No. 9237.

No. 9274A.

No. 9273A.

9237. **THERMOMETER, Soil, Recording.** Consists of a recorder case containing clock movement for revolving the chart, and a steel coil spring for actuating the recording pen arm; a flexible connecting tube through which the action of the mercury in expanding or contracting is transmitted from the sensitive element (the bulb) to the coil spring; and a bulb or sensitive element which is inserted at the point whose temperature is to be determined. The spring, the steel connecting tube, and the bulb are welded together, forming a hermetically sealed mercury filled system. When the mercury in the system expands or contracts because of temperature changes at the bulb, the action is instantly transmitted through the connecting tubing to the spring and an accurate record made on the chart by the recording pen arm.

This instrument may be used to great advantage in determining the relative temperatures of drained and undrained soils; of cultivated and uncultivated fields; of fallowed and cropped fields; and the effect of different methods of cultivation upon soil temperature. It may also be used to determine the effect of the temperature of the soil and sub-soil on the growth of plants, and the effect of soil temperature on the bacterial activities of the soil and therefore on the formation of nitrates in the soil.

The recorder case is of black enameled iron with nickel-plated ring, and the equipment furnished includes 100 charts, divided for making one revolution in seven days and graduated from —40° to +120°F. in 2° divisions, extremely sensitive bulb 18 inches long, and 15 feet of flexible protected capillary tubing. (In case a greater length of tubing is desired, state exact length in order and add 40¢ per foot for each foot over 15.) Complete with supply of ink and pens ..... Net $ 48.00

9237A. **THERMOMETER, Soil, Recording.** Same as No. 9237, but with 100 charts graduated from —20° to +60°C. in 1° divisions..... Net 48.00

9237C. **CHARTS** for No. 9237, 8-inch, 7-day. Per hundred ..... Net .75

9237D. **CHARTS** for No. 9237A, 8-inch, 7-day. Per hundred ..... Net .75

9254A. **CELLULOID STRIP,** 36 x 3 in., for either No. 9253 Capillarity Tube or No. 9254 Extension Tube. (See page 36.)..... .30

9257. **CAPILLARITY TUBES,** of celluloid, protected by wire gauze. (See page 36 for full description. The 12 in. length is new.)

Length, inches	12	24	36	48
Each	$ 0.55	.75	1.10	1.65

9257A. **CELLULOID STRIPS,** for No. 9257 Tubes.

Length, inches	12	24	36	48
Each	.20	.45	.60	.85

9273A. **SPECIFIC GRAVITY TUBE,** for determining the apparent specific gravity of surface soils under field conditions. Of steel, 12 inches long by 4 inches inside diameter, with cutting edge ..... 4.0(

9274A. **DRIVING HEAD** of cast iron. For use with No. 9273A Specific Gravity Tube to prevent battering the upper edge when the tube is driven into the ground..... 1.1(

MOISTURE TESTER ACCESSORIES—Continued from page 47.

9332. **CONDENSER TUBE,** for moisture testers.....Net $ 0.25

9333. **GRADUATED CYLINDER,** for moisture testers, 25 c. c., graduated in one-fifth c. c..Net .60

9334. **GRADUATED CYLINDER,** for moisture testers, new design; for use when 50 gram samples are being tested. With this graduate the percentage of water is given by direct reading without the necessity of multiplying by two, as with the original graduate .....Net .75

9335. **OIL,** for moisture testers, according to the specifications of the Bureau of Plant Industry. Per gallon can, Net, .60; per 5-gallon can .....Net 2.25

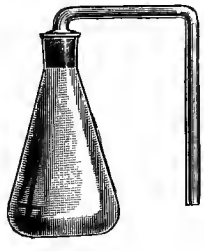
9336. **RUBBER STOPPERS NO. 5.** Especially designed to stand the high temperature existing in moisture test flasks; are absolutely necessary when copper flasks are used. Per dozen, Net, 1.60; per pound.....Net 2.25

9337. **THERMOMETERS.** 0 to 200 degrees centigrade. Special design for moisture testers. Each .....Net 1.50

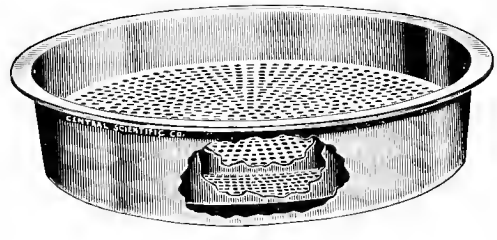
G361. **ELECTRIC SIGNALLING DEVICE,** for use with any Moisture Tester. Bell sounds when thermometer registers 185°C. Prevents breakage of thermometers due to high temperatures.

For Tester No.....	G350-2	G353-5	G356-8
When ordered with Tester.....Net	$6.00	11.00	16 00
When ordered separately.....Net	8.50	15.50	22.50

G363. **AUTOMATIC OIL MEASURING AND GRAIN SEPARATING DEVICE.** Consists of a galvanized iron tank, reinforced strongly with brass, and so mounted on brackets that it can readily be attached to any of the moisture testers listed on page forty-seven; fitted with a measuring device which automatically measures out 150 c. c. of oil into test flask by merely pushing the neck of the flask upward against an automatic catch. The cover of the tank is fitted with a funnel shaped sieve, which catches the mixture of grain and oil as it is poured from the flask after the test, and strains the oil into the container below. In this way the oil is kept free from dust and dirt, and the same oil may be used repeatedly.....Net 5.00



No. 9308.



No. 9339A.

9308. **SULPHUR DETERMINATION APPARATUS,** for determining whether grain has been bleached, as recommended in Circular No. 111 of the United States Bureau of Plant Industry. Consists of an Erlenmeyer flask with ground-in stopper, and connecting tube. Capacity, 500 c. c..... 2.00

9339A. **SIEVES, Corn Test.** Similar to No. 9339 (page 49), but of aluminum, 10 inches in diameter .....Net 3.50

9339B. **SIEVES, Oblong Telescoping,** of non-rusting metal, for quick dockage determinations and tests on samples of wheat. Set consists of one sieve with 12/64 in. round holes, one with 9/64 in. triangular holes, one with 5/64 in. round holes, and one bottom pan..Net 4.00

9339C. **SIEVES, Oblong Telescoping,** similar to No. 9339B, but for barley and oats. Set consists of one sieve with holes 9/64 x 3/4 in., one with 12/64 in. round holes, one with 5/64 in. round holes, and one bottom pan.....Net 4.00

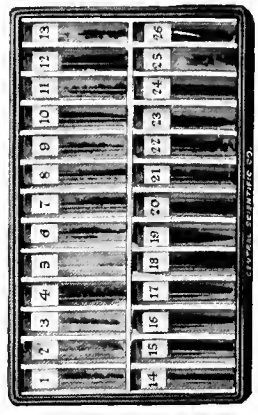
9339D. **SIEVES, Oblong Telescoping,** similar to No. 9339B, but for corn. Set consists of one sieve with 1/4 in. round holes, one with 9/64 in. round holes, and one bottom pan.....Net 3.00

9339E. **SIEVES, Oblong Telescoping.** Set consists of one sieve each of the six styles mentioned under Nos. 9339B, 9339C, and 9339D, and one bottom pan, thus making a complete set for use with wheat, barley, oats and corn.....Net 7.00

9347. **FLOWER POT SAUCERS,** first quality, to match No. 9345 Flower Pots, page 51.

Diameter, inches.....	3	4	6	8
Per dozen	.12	.17	.33	.60

No. 9389A.



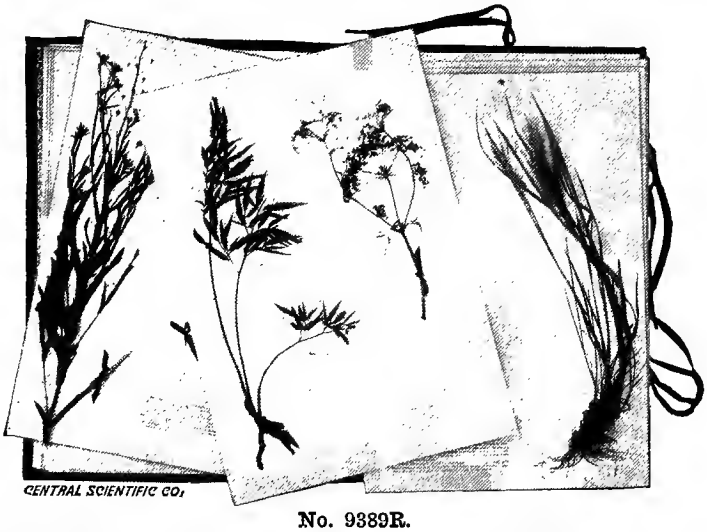
No. 9389F.

The collections listed on this page are prepared by the Department of Botany of the North Dakota Agricultural College.

9389A. **PLANT DISEASE COLLECTION,** showing twenty typical plant diseases. Each specimen is enclosed in a box with celluloid topped sliding cover, and the entire set is contained in a substantial case about 17¼ x 11½ x 1 in. Descriptions are included. Net $ 3.50

9389F. **WEED SEED COLLECTION, No. 1.** Seeds of twenty-six weeds in labeled vials as follows: Canada Thistle, Chess, Cockle (2 var.), False Flax, Frenchweed, Marsh Elder, Mustard (4 var.), Peppergrass, Pigeon Grass, Pigweed (3 var.), Prickly Lettuce, Quack Grass, Ragweed, Russian Thistle, Shepherd's Purse, Sunflower, Water Hemlock, Wild Barley, Wild Buckwheat, Wild Oats. In heavy compartment pasteboard box about 9½ x 5½ x ¾ inches.....Net 2.50

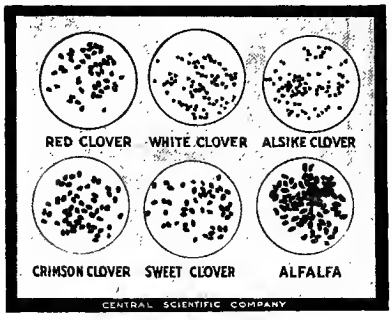
9389G. **WEED SEED COLLECTION, No. 2.** Same as No. 9389F, but with the following twenty-six specimens: Beggar Tick, Bindweed, Bur Clover, Catchfly, Chicory, Cinquefoil, Cocklebur, Crab Grass, Dock, Dodder (3 var.), Ergot, Evening Primrose, Holy Grass, Milkweed, Persicaria, Plantain (2 var.), Ragweed, Sandbur, Sorrel, Sow Thistle, Sweet Clover, Vetch, Witch Grass.....Net 2.50



No. 9389R.

9389R. **WEED COLLECTION, No. 1.** A portfolio showing specimens of mature and immature plants corresponding to No. 9389F Weed Seed Collection, mounted on heavy cards about 16½ x 11½ inches, with full descriptions .....Net 3.50

MATERIALS FOR MOUNTING SEED SPECIMENS



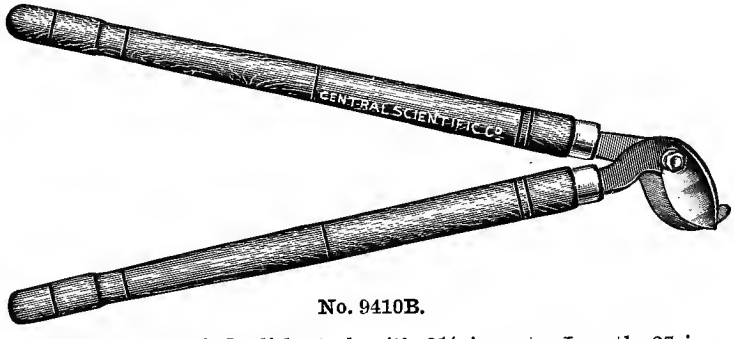
No. 9390A.

On account of the demand for materials with which to mount small seed specimens similar to those described under Nos. 9390A-F on page 61, we are listing the parts below.

9390R. **PERFORATED CARDS,** 3¼ x 4 in., with six holes 1 inch in diameter, without printing. Per dozen, Net $0.25; per hundred.....Net $ 1.80

3784. **SLIDE COVER GLASSES,** 3¼ x 4 in. Two required with each card. Per dozen....Net .20

3783. **SLIDE BINDING,** in strips, one strip required with each card. Binder's black cloth, heavily gummed on one side with a special gum. Per 50 strips.....Net .15



No. 9410B.

9410B. **LOPPING SHEAR,** blades of English steel, with 2½ in. cut. Length, 27 in..... 2.50

REPAIRS FOR FACILE, JR., BABCOCK TESTERS

These repairs are for Nos. 5056, 5056A, and 5057, page 85; and Nos. 9613, 9615, and 9616, page 87. The numbers in parenthesis are the manufacturer's numbers, which in some instances appear on the parts.

9607. **COVER,** with thumb screw and collar. This is the part of the gear case which attaches to the table. (452-1).....Net .5

9607D. **CASE.** This is the front of the gear case on which the name "Facile" appears. (451-1).....Net .6

9607E. **THUMB SCREW.** (454H).....Net .1

9607F. **SWIVEL** or collar for thumb screw. (454G).....Net .0

9607G. **SCREWS** for cover. (454I).....Net .0

9607H. **CRANK** only, without handle. (453).....Net .2

9607J. **CRANK,** complete with handle. (454E).....Net .2

9607K. **WOOD HANDLE** for crank. (454D).....Net .0

9607L. **HANDLE RIVET.** (454C).....Net .0

9607M. **CRANK SHAFT.** (454B).....Net .1

9607N. **TAPER PIN** for attaching crank to crank shaft. (454F).....Net .0

9607P. **GEAR** for inner end of crank shaft (454).....Net .7

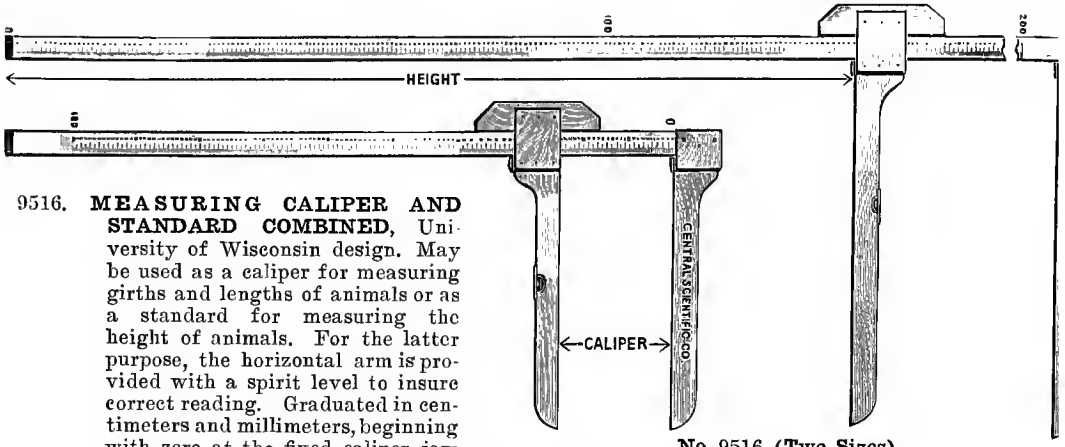
9607R. **WORM SPINDLE,** with slot at top for head. (454A).....Net .3

9607S. **BALL** for bearing. (454J).....Net .0

9607T. **TWO-BOTTLE HEAD,** with rivets and pins but without cups or cup holders. (455).Net .5

9607U. **FOUR-BOTTLE HEAD,** with rivets and pins, but without cups or cup holders. (456).Net .7

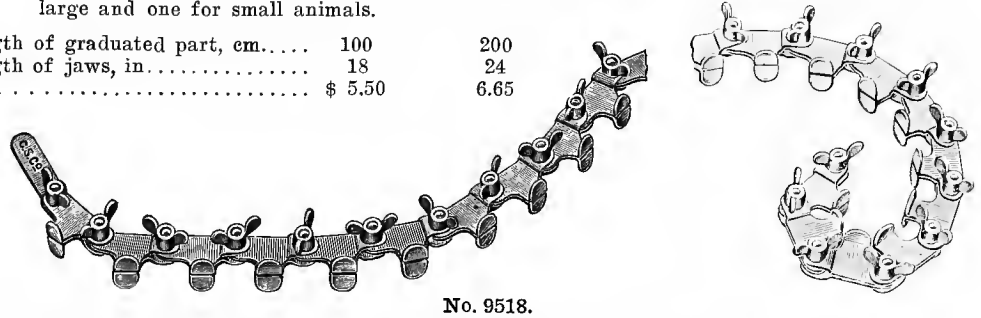
9607V. **CUP HOLDER AND BRASS CUP.** (457-457A).....Net .2



No. 9516 (Two Sizes).

9516. **MEASURING CALIPER AND STANDARD COMBINED,** University of Wisconsin design. May be used as a caliper for measuring girths and lengths of animals or as a standard for measuring the height of animals. For the latter purpose, the horizontal arm is provided with a spirit level to insure correct reading. Graduated in centimeters and millimeters, beginning with zero at the fixed caliper jaw on one side of the measuring stick for caliper measurements, and with zero at the extreme end of the stick on the other side for height measurements. The movable jaw is held by a spring, and is reversible for use in height measurements, as shown in the illustration. Two sizes are provided; one for large and one for small animals.

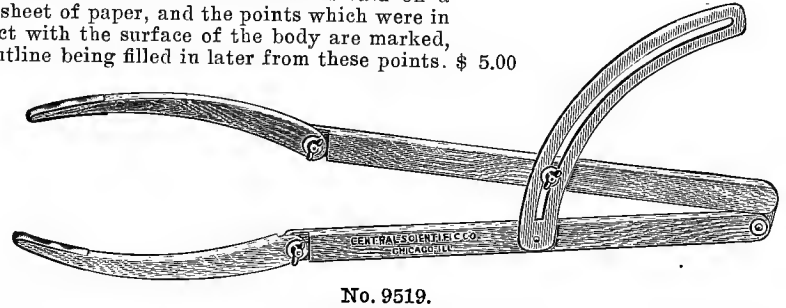
Length of graduated part, cm.....	100	200
Length of jaws, in.....	18	24
Each	$ 5.50	6.65



No. 9518.

9518. **ANIMAL MEASURING CHAIN,** designed in the Department of Dairy Husbandry of the University of Missouri, for taking accurate cross sections of the bodies of animals, or of the external shape of any parts of the bodies. This chain is constructed of short links so fastened together that it is sufficiently rigid to hold any shape given it, and yet sufficiently flexible to adapt itself to the shape which it is desired to measure. It is 150 cm. long, which makes it possible to measure the heart girth of the largest cattle by the method described below.

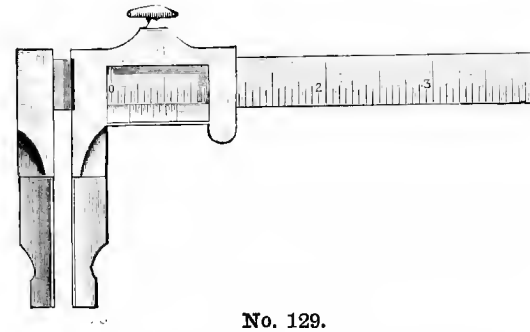
In taking the cross section outline of a large animal, a string is first placed around the body at the point where the measurement is to be made, and a chalk mark is drawn coincident with the location of the string. The chain is then applied over the chalk mark, taking one-half of the body at a time, and tightening the thumb screws so that the chain retains the exact shape of the body. Opposite points on the body are best found by using No. 9516 or No. 9519 Calipers. After each measurement the chain is laid on a large sheet of paper, and the points which were in contact with the surface of the body are marked, the outline being filled in later from these points. $ 5.00



No. 9519.

9519. **MEASURING CALIPER,** for taking measurements at points on the body of animals which cannot be taken by other instruments. Designed particularly for use in connection with No. 9518 Animal Measuring Chain, to get the distance from one side to the other of the animal's body. The arms of the caliper are jointed so that it is possible to take measurements at points which could not be reached by calipers of other designs.

No. 9599C.



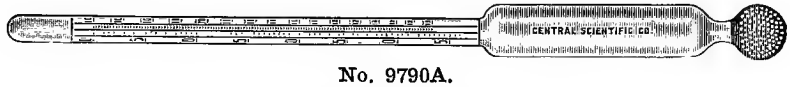
No. 129.

9599C. **KILLING KNIFE, Poultry,** of finely tempered steel, with nickel-plated handle; blade sharpened on one edge ..... Net $ 0.50

129A. **CALIPER, Poultry,** for use in studying the growth of chickens from hatching until maturity. With this caliper, depth and length of body, length of shank, etc., may be measured. Of steel, with jaws 2⅛ in. long. Graduated in millimeters, with vernier reading to 10ths, on one side; and on the other side on one edge in 16ths of an inch, with vernier reading to 128ths, and on the other edge in 20ths of an inch, with vernier reading to 100ths. Length of graduated part, 8 inches and 200 mm..... 4.45

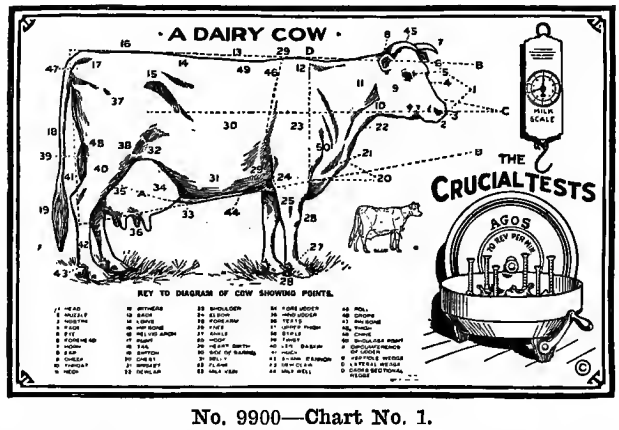
129. **CALIPER, Poultry.** Similar to No. 129A, but shorter and graduated only in the metric system, with vernier reading to 10ths of millimeters. Length of graduated part 10 cm. 1.25

9607-9607V. **REPAIR PARTS** for Facile, Jr., Babcock Testers, see page 187.



No. 9790A.

9790A. **HYDROMETER, Lime-Sulphur (Li-Sul-Sprayometer),** New York and Pennsylvania Pattern, for testing the lime sulphur wash used in spraying. Graduated from 0° to 38° Baumé in ½° divisions, and from 1.000 to 1.100 specific gravity in .001 graduations.. .90

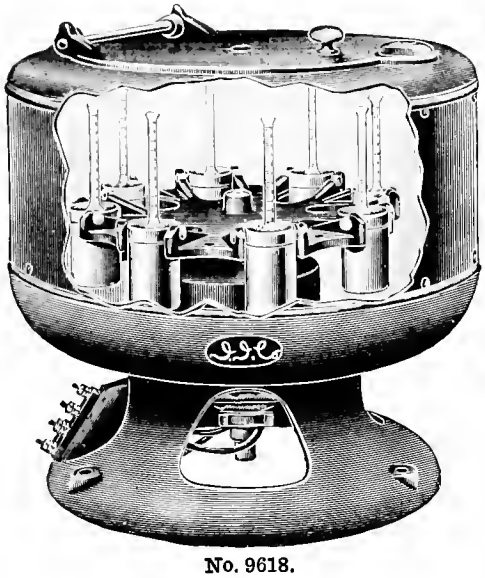


No. 9900—Chart No. 1.

9900. **AGRICULTURAL CHARTS,** on cloth, 3 feet 6 inches by 2 feet 4 inches. These charts were designed by Prof. G. A. Bricker of Ohio State University, and the diagrams are sufficiently large to be clearly seen across a large schoolroom. The series includes the following 10 charts:

1—The Dairy Cow.
2—The Beef.
3—The Horse.
4—The Chicken.
5—The Hog and the Sheep.
6—The Walking Plow.
7—Spraying.
8—Grafting.
9—Corn.
10—Wheat.

Complete with eyelets for hanging. Per chart ..... Net .50



No. 9618.

No. 9034.

INTERNATIONAL CENTRIFUGES FOR MILK TESTING AND MECHANICAL ANALYSIS OF SOILS

MILK TESTING

9618. **BABCOCK MILK TESTER, International, Electric,** 8-bottle size. The motor is entirely enclosed in a massive bell shaped pedestal casting, and the head and cups are designed to give strength, durability, simplicity, and convenience of manipulation. For use with regular 6-inch Babcock test bottles, but not with 9-inch cream test bottles. 18 inches high closed, 28 inches high open, and 17 inches in diameter, with a shipping weight of about 160 pounds. Furnished with trunnion cups and speed control rheostat, but without glassware.

Voltage	110 D. C.	220 D. C.	110 A. C., 60 cycles.	220 A. C., 60 cycles.
Each .....Net	$ 54.00	58.00	60.00	65.00

9618A. **BABCOCK MILK TESTER, International, Electric,** 16-bottle size. Similar in general description to No. 9618 and for use with regular 6-inch Babcock test bottles. 9-inch cream test bottles may also be used if No. 9619 Cups with No. 9619A Trunnion Rings are purchased. 23 inches high closed, 35 inches high open, and 24 inches in diameter, with a shipping weight of about 300 pounds. Furnished with trunnion cups and speed control rheostat, but without glassware.

Voltage	110 D. C.	220 D. C.	110 A. C., 60 cycles	220 A. C., 60 cycles.
Each .....Net	76.00	80.00	105.00	107.00

ACCESSORIES FOR INTERNATIONAL BABCOCK MILK TESTERS.

9619. **METAL CUP** for 9 in. Babcock bottles.....Net $ 0.75

9619A. **TRUNNION RING** for No. 9619 Metal Cup.....Net .35

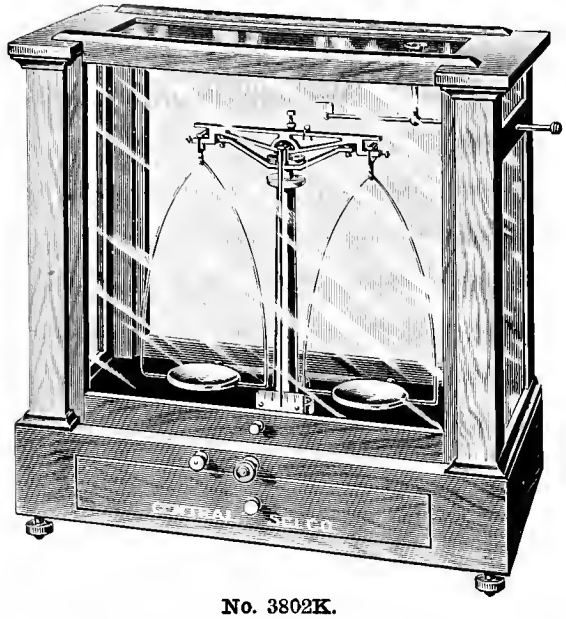
For **GLASSWARE** and **OTHER ACCESSORIES** see pages 87-98.

MECHANICAL ANALYSIS OF SOILS

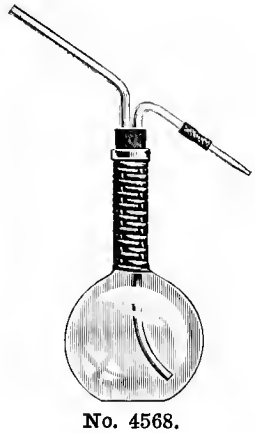
9034. **CENTRIFUGE, International, Electric,** with equipment for mechanical analysis of soils, including speed control rheostat, No. B1238 Eight-tube Head, eight No. B1288 Metal Tubes, 100 c. c., with No. B1289 Trunnion Rings, 72 No. B1318 Plain Glass Tubes, 100 c. c. and an 8-tube Rack. 23 inches high closed, 35 inches high open, and 24 inches in diameter, with a shipping weight of about 300 pounds.

Voltage	110 D. C.	220 D. C.	110 A. C., 60 cycles.	220 A. C., 60 cycles.
Each .....Net	80.00	84.00	101.00	104.00

B1318. **TUBES, Glass,** plain lipped, 100 c. c., for No. 9034 Centrifuge. Per dozen, Net 1.75; per 6 dozen .....Net 7.00



No. 3802K.



No. 4568.

No. 4615.

No. 4615A.

3802K. **BALANCE, Analytical,** in polished mahogany case, with glass on four sides and the top. The beam is of aluminum, 6 inches long, graduated in 50 divisions from center to each end, and with convenient rider arrangement; index plate graduated in red. The bearings and knife edges are of agate; has 4½ inch bows, and pans 2½ inches in diameter with improved arrangement for arrest. Capacity 100 grams; sensitive to 1/10 milligram. $ 55.50

3802L. **BALANCE, Analytical.** Same as No. 3802K, but with heavy black plate glass base over the mahogany base 65.50

3802M. **BALANCE, Analytical.** Same as No. 3802K, but sensitive to 1/20 milligram..... 80.00

3802N. **BALANCE, Analytical.** Same as No. 3802M, but with heavy black plate glass base over the mahogany base..... 90.00

3802P. **BALANCE, Analytical.** Same as No. 3802K, but sensitive to 1/50 milligram..... 100.00

3802Q. **BALANCE, Analytical.** Same as No. 3802P, but with heavy black plate glass base over the mahogany base..... 110.00

3902K. **WEIGHTS, Precision,** similar to No. 3902 (page 129), but with the weights carefully lacquered instead of gold plated. This avoids the high duty on gold plated articles under the Tariff Act of 1913. Many laboratory experts consider the lacquered finish preferable to gold plating .....Net 12.00

3904K. **WEIGHTS, Precision,** similar to No. 3904 (page 129), but carefully lacquered, as described under No. 3902K.....Net 10.00

4568. **BOTTLES, Washing.** Same as No. 4567 (page 135), but with wicker covered neck, for use with hot water.

Capacity, ounces	16	32
Each	.70	.90

4614D. **BURETTES, Mohr's,** same as No. 4614 (page 139), but with side tube for refilling.

Capacity, c. c	25	50	100
Graduated to	1/10	1/10	1/10
Each	.85	1.20	2.00

4615. **BURETTES, Schellbach's,** with white back and dark colored lines, showing the meniscus plainly. With tip and connection for pinchcock, but without pinchcock.

Capacity, c. c	25	50	100
Graduated to	1/10	1/10	1/10
Each	1.00	1.33	2.25

4615A. **BURETTES, Schellbach's,** same as above, but with glass stop cock.

Capacity, c. c	25	50	100
Graduated to	1/10	1/10	1/10
Each	1.67	2.20	3.00

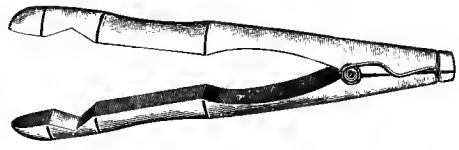
4615B. **BURETTES, Schellbach's,** same as No. 4615, but with side tube for refilling.

Capacity, c. c	25	50	100
Graduated to	1/10	1/10	1/10
Each	1.20	1.50	2.45

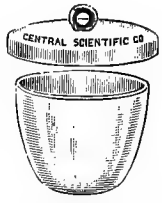
4615C. **BURETTES, Schellbach's,** same as No. 4615, but with Greiner and Friedrich's three-way stopcock.

Capacity, c. c	25	50	100
Graduated to	1/10	1/10	1/10
Each	2.00	2.50	3.35

No. 5054A.



No. 4739.



No. 4807A-B.

5054A. **BURNER, Alcohol Lamp,** noiseless, economical, and safe. Used on Moisture Testers. Burns with intensely hot blue sootless flame, with denatured alcohol as the fuel. Burns 3 hours at one filling. Excellent for laboratory use when gas is not available.. $ 3.00

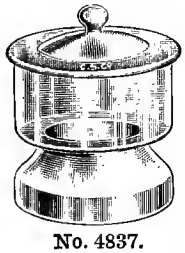
4739. **CLAMP, Flask,** for large tubes and flasks, of wood, 10½ inches long, with spring..... .45

4807A. **CRUCIBLES, Royal Berlin Porcelain,** glazed inside and outside, without cover.

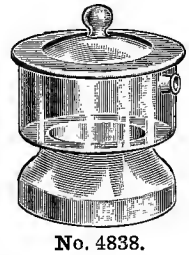
No.	000	00	0	1	2	3	4	5
Capacity, c. c.	5	10	15	30	57	95	155	280
Diameter, mm.	26	30	35	41	52	62	72	87
Height, mm.	19	25	27	35	43	50	59	72
Each	$ 0.13	.16	.20	.28	.36	.45	.55	.66

4807B. **CRUCIBLE COVERS, Royal Berlin Porcelain,** for No. 4807A Crucibles.

No.	000	00	0	1	2	3	4	5
Each	.07	.07	.07	.10	.10	.14	.18	.21



No. 4837.



No. 4838.

No. 4842.

No. G171.

4837. **DESICCATORS, Scheibler's,** of Bohemian glass, cover ground air-tight. (The 8 in. size is new.)

Diameter, inside, inches	3½	5	6	8
Each	.60	1.00	1.20	2.50

4838. **DESICCATORS, Scheibler's.** Same as No. 4837, but with tubulature on the side.

Diameter, inside, inches	6	8
Each	1.95	3.20

4842. **DESICCATOR PLATES,** of porcelain, with three small feet and with 3 to 8 holes, according to size of plate. (The 7½ inch size is new.)

Diameter, inches	3⅛	4¾	5½	7½
Each	.67	.84	1.10	1.65

4842A. **DESICCATOR PLATES, Porcelain,** with 7 holes, each 26 mm. in diameter.

Diameter, inches	4¾	5½
Each	1.00	1.20

G171. **DISH, MILK, Royal Berlin Porcelain,** for quickly reducing large amount of sample to ash; flat bottom, straight sides; inside dimensions, diameter 67 mm., depth 13 mm... .5

4875B. **EXTRACTION APPARATUS, Soxhlet's.** Same as No. 4875 (page 63), but with all joints ground air-tight. Complete with three flasks and condenser, but without extraction shells.

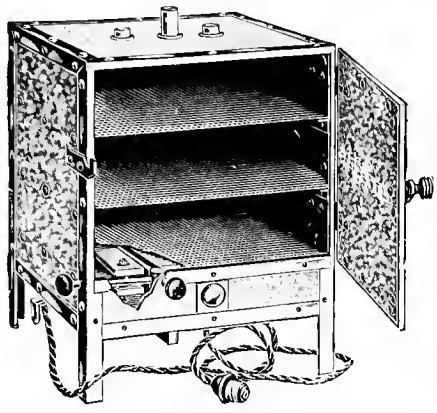
Capacity to top of siphon, c. c.	60	100
Each	4.25	5.00

4879C. **EXTRACTION SHELLS, Paper,** same as No. 4879 (page 64), but double thick; 22 mm. in diameter by 80 mm. long. Each, Net 0.18; per dozen.....Net 3.3

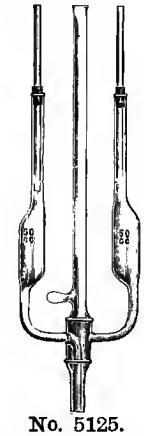
4906A. **FLASKS, Kjeldahl's,** digesting, pear shaped, with extra long necks, new Jena glass. (The 800 c. c. size is new.)

Capacity, c. c.	200	500	800	1000
Each	.23	.40	.50	.60

4906B. **FLASK, Kjeldahl's,** short neck, new Jena glass, 800 c. c..... .4



No. G421.



No. 5125.

G421. **OVEN, Electric Drying,** patented Jan. 6th, 1914, with automatic temperature control. The chamber of the oven is 10 inches high, 12 inches wide and 10 inches deep. Weight, 23½ lbs.; arranged for 110 or 220 volts direct or alternating current. (In ordering, state voltage desired.) Complete with three shelves, thermometer, six foot cord and plug, and full directions.....Net $ 25.00

5125. **PIPETTES, Bailey's Automatic,** for delivering quickly an approximately constant amount of a reagent. Since two measuring vessels are furnished, there is no waste of time in waiting for the apparatus to refill. The volume of the pipette is governed by raising and lowering a sliding capillary tube, so that it is possible to use a pipette of 100 c. c., for example, for smaller amounts when desired. Mounted on board for attaching to wall.

Graduated capacity, c. c.		50	100
Each	Net	9.00	9.00

No. G461.

G461. **SAMPLER, Bag,** for sampling small seeds in sacks. By means of its sharp and slender point, the sampler can be thrust through the mesh of bagging, forcing it apart without tearing. 7/32 in. diameter, 4¼ in. long; each.....Net .75

G462. **SAMPLER, Bag,** similar to No. G461, but for grain; ⅜ in. diameter, 6 in. long; each, Net .75

No. G463.

G463. **SAMPLERS, Grain.** These samplers consist of two polished brass tubes, one fitted inside of the other, and having openings matching each other. By turning the handle of the inner tube, it revolves, thus opening and closing the holes.

No.		2	3	4
Diameter, inches		1¼	1½	1¾
Length, inches		44	44	52
Each	Net	6.00	6.75	7.50

No. 5265.

No. 5266.

5265. **SPATULAS, Steel,** wooden handle. (The 8 and 10 inch sizes are new.)

Length of blade, inches	3	4	5	6	8	10
Each	.22	.27	.30	.42	.55	.83

5266. **SPATULA, Steel,** wooden handle, flexible narrow point, for weighing. Length of blade, 5 in. .35

5420. **TONGS, Crucible, Steel.** Double bend, forged, nickel-plated, with lock joint. Length, 18 inches. 1.50

FITTINGS FOR Nos. 4858-4860B DRYING OVENS (Page 157)

G425. **WATER GAUGE,** fitted to any of the above double wall ovens, extra. 1.0

G426. **WATER LEVEL, Kekule,** fitted to any of the above double wall ovens, extra. 1.6

INDEX

A

	PAGE
Abney's Level	74
Absorption Apparatus	5
Accident Cabinet	170
Acetylene Gas Burner	139
Acid Bottle	89
Acid Bottle Trunnion	89
Acid Burettes	89
Acid Dippers	89
Acid Gloves	151
Acid Measures	89
Acid Pipettes	89
Acid, Sulphuric	87
Acidity Tester for Soils	33
Acidometer	87
Acid Tests	96
Agricultural Charts	189
Agricultural Lantern Slides	111-118
Agricultural Text Books	172-182
Alarm Thermometer, Automatic	108
Alcohol Burners	140
Alcohol Lamps	153, 192
Alfalfa Samples	59-61
Alkalimeters	9
Alkaline Tablets	96
Ames Moisture Test	96
Anatomical Charts	81
Anatomical Models	80-82
Animal Husbandry	77-84
Animal Measures	79, 188
Aprons	119
Arrows, Surveyors'	107
Asbestos Drying Oven	158
Asbestos Gloves	151
Asbestos Plates or Pads	170
Aspirators	6, 147
Aspirator Bottles	6, 135
Augers, Soil	24, 183
Auger, Soil Tube	40
Auger Field Sets	25
Automatic Alarm Thermometer	108
Automatic Oil Measuring Device	185

B

Babcock Milk and Cream Testers	85-87, 190
Babcock Test Bottle Rack	93
Babcock Test Traveling Outfits	87
Bacteriological Soil Sampling Tubes	183
Bailey's Pipettes	193
Balances	90, 120-128, 191
Ball Mills	18
Balls for Mills	18
Barley Samples	53, 57, 58
Barley Score Cards	62
Barrel Cart	101
Barrel Sprayer	101
Battery, Dry	32
Battery Jars	152
Beakers	131
Beaker Brush	138
Beans, Samples	60
Bellows	132
Benningsen's Flask	14
Bins, Soil	7, 8
Blast Lamps	132, 133
Block Microscopes	156
Blotters	170
Blow Pipes	133
Board Rule	76
Boats, Combustion	144
Bolting Cloth, Silk	30
Books	172-182
Bordeaux Nozzle	102
Botanical Mounts, Riker's	104
Bottles	134-137, 191
Bottle, Acid	89
Bottle, Aspirator	6
Bottle, Butter Test	88
Bottle, Mechanical Analysis of Soils	8
Bottles, Milk	90
Bottles, Milk and Cream Test	88
Bottles, Screw Cap	90
Bottles, Sterilizer	28
Bottom Pans for Sieves	31
Bottom, Perforated, for Soil Tubes	37
Brain of Horse, Models	80
Brain of Ox, Model	81
Briggs' Filters	16
Brushes	26, 39, 91, 138
Bucket Sprayers	99
Buckwheat Samples	60, 61
Budding Knives	71, 72
Budding Tool	73
Bunsen Burners	139, 140
Burettes	89, 139, 191
Burette Brush	138
Burette Clamps	142
Burette Floats	139
Burette Supports	166
Burners	139, 140, 192
Burners, Barthel's	140
Butter Fat Oil Test Tubes	98
Butter Refractometer	94
Butter Test Bottle	88

C

Cabinet, First Aid	170
Calcium Chloride Tubes	141
Calipers, Animal	188
Calipers, Poultry	189
Calipers, Tree	74
Calorimeter	38
Camel Hair Brushes	138
Candles	170
Capillarity Tubes, Soils	36-38, 184
Capillary Tubing	150
Caponizing Sets	84
Caps for Milk Jars	90
Carbon Filters	147
Carbonic Acid Apparatus	9, 141
Carborundum Paper	171
Carrying Case for Augers	28
Casein Tube	91

INDEX—Continued

	PAGE
Casseroles	142
Cattle Instruments	83, 84
Cattle Score Cards	79, 95
Celluloid Strips for Soil Tubes	36, 184
Cement	170, 171
Centrifugal Machines	9, 10, 85-87, 190
Chain Tapes	106
Chalk Line	170
Chamois Skins	170
Charts, Agricultural	189
Charts, Milk Record	126
Charts, Veterinary	81
Cheese Cloth	170
Chemical Apparatus and Supplies	119-169
Chemical Balances	120-122, 191
Chemical Labels	152
Chemical Reagent Bottles	136, 137
Chemicals	See Catalog R.
Chemical Thermometers	167
Chevalier's Creamometer	92
Chisel, Grafting	73
Churns, Family	91
Circulatory System of a Ruminant, Chart	81
Clamps	142, 143, 192
Clinometers	74
Cloth, Emery	170
Cloth, Silk Bolting	30
Cloth, Tracing	170
Clover Samples	59-61
Collecting Trowel	46
Collection of Hoofs of Horses, Models	80
Color Tray	35
Colored Glasses, Lovibond's Standard	11
Colorimeters	11
Combined Acid Bottle	89
Combustion Boats	144
Combustion Tubes	144
Combustion Tubing	150
Compacting Machine	12
Compactor, Spring Board	12
Compasses, Surveying	75
Compound Microscopes	154, 155
Condensers	21, 144
Condenser Bulb Tubes	43
Condenser Clamps	143
Condensers, Kjeldahl's	42
Condenser, Knorr's	64
Condensers, Soxhlet's	64
Condenser Tube	185
Conductivity Apparatus	13
Conductivity Bridge	32
Container, Grain	46
Containers, Soil	7, 8
Cord	170
Corks	144
Corn Samples	54, 55
Corn Score Cards	62
Corn Test Sieves	49, 185
Corrosive Sublimate Tablets	93
Cotton Discs	97
Cotton Samples	60, 61
Cotton Score Cards	62
Counter Brush	138
Couplings for Filter Pumps	147
Covers for Sieves	31
Cow Models	81
Crash Toweling	171
Cream Balance, Hydrostatic	90, 126
Cream Pipettes	93
Cream Score Cards	95
Cream Test Balances	125, 126
Cream Test Bottles	88
Cream Test Tubes	98
Cream Testers	85-87, 190
Creamometer	92
Crucibles	145, 192
Crucible Tongs	168, 193
Crystallizing Dishes	146
Cup for Water Retention	40
Cylinders, Graduated	151, 185

D

Dairy Cattle Score Cards	95
Dairy Husbandry	85-98
Dairy Thermometers	98
Decimal Milk Balances	126
Desiccators	145, 192
Digesting Flasks	43, 148
Digesting Shelves	41, 43
Digestion Cups, Porcelain	13
Dippers, Acid	89
Dipping Refractometer	94
Dirt Scale	50
Discs, Absorbent Cotton	97
Diseases of Plants	183
Dishes	91, 146, 193
Dispensing Scale	128
Dissecting Microscopes	150
Distillation Apparatus	43
Distilling Flasks	43, 148
Dividers	9
Doublet Magnifiers	150
Double-Tree Apparatus	7
Draft Determination Apparatus	77, 78
Drainage Apparatus	1
Drainage Trays	3
Drawing Pencils	17
Driving Heads	39, 183, 184
Dropping Funnels	21, 144
Drying Ovens	157-161, 193
Drying Tables	15
Drying Tower	14
Drying Tubes	21, 144
Dynamometers	7

E

Ear of Horse, Model	8
Egg Score Cards	8
Electric Babcock Milk Testers	8
Electric Heaters	6
Electric Muffle Furnaces	1
Electric Ovens	158-161, 193
Electric Signalling Device for Moisture Testers	18
Elutriating Flask	1
Emery Cloth	17
Emery Paper	17
Erdmann's Floats	13
Erlenmeyer Flasks	14
Evaporating Dishes	14
Evaporation Gauge	1

INDEX—Continued

PAGE

Evaporation Tank 15
Evaporimeters 15
Extensions for Augers..... 25
Extraction Apparatus 63-65, 192
Extraction Flasks 64, 149
Extraction Shells 64, 192
Extraction Tubes 63, 64
Extractors 63, 64
Eye of Horse, Models..... 80
Eyepiece Micrometers 156

F

Family Churns 91
Family Scale 128
Farm Crops Laboratory Material..... 53-61
Farm Meteorology 108, 109
Farm Surveying 105-107
Farm Levels 105, 106
Fat Free Paper for Milk Analysis..... 92
Fertilizers 62
Files 146
Filters, Briggs' 16
Filter Field Sets..... 16
Filter Paper 147
Filter and Pump..... 16
Filter Pumps 147
Filter Tubes 16, 147
First Aid Cabinet..... 170
Flask Brush 138
Flasks.....21, 43, 47, 148, 149, 192
Flask, Elutriating 14
Flasks, Extraction 64
Flasks, Kjeldahl's 43, 148
Flasks for Moisture Testers..... 47
Flax Samples 60, 61
Flax Score Cards..... 62
Floats, Erdmann's Burette..... 139
Flower Pots and Saucers..... 51
Foetus of Ox, Model..... 81
Foetus of Sheep, Model..... 81
Foetus of Swine, Model..... 81
Foot of Ox, Model..... 81
Foot Plate 25
Forceps 149
Foresters' Instruments 74-76
Freas' Electric Ovens..... 160
Fresenius' Nitrogen Apparatus..... 43
Friedrichs' Extraction Apparatus..... 63
Frost Predictors 108, 109
Fruit Jars 171
Fruit Score Cards..... 62
Funnel Brush 138
Funnels 21, 149, 150
Funnel Scoop and Counterpoise..... 127
Furnaces, Muffle 17
Fused Silica Ware.....145, 146

G

Gas Bags 150
Gasoline Blast Lamps.....132, 133
Gasoline Burners 140
Gas Stoves 140
Gas Washing Bottles..... 135
Gauge, Evaporation 14
Gauze, Wire 150

PAGE

General Apparatus and Supplies.....119-171
Genitals of Mare, Model..... 80
Genitals of Stallion, Model..... 80
Germinating Boxes 44
Germinating Plates 45
Germinating Trays 45
Germination Model 44
Glass Beads 150
Glass Plates 162
Glass Rods 150
Glass Tubing 150
Gloves 151
Glue 171
Gooch's Crucibles 145
Grade-Draft Apparatus 78
Graduated Tubes for Colorimeter..... 11
Graduates 151, 185
Grafting Chisel 73
Grafting Knives 72
Grafting Models 66
Grafting Wax 73
Grain Container 46
Grain Samplers 193
Grain Samples 53-61
Grain Score Cards..... 62
Grain Test Balances..... 127
Grain Tester Fillers..... 50
Grain Testers 49, 50
Grasses 54, 59, 61
Grinding Mills 18-20

H

Hart's Casein Tube..... 91
Head of Horse, Model..... 80
Head of Ox, Model..... 81
Heart of a Horse, Model..... 80
Heat Absorption Boxes..... 5
Heaters, Electric 65
Hofmann's Clamps 142
Hog Score Cards..... 79
Hogs, Models 82
Hoist, Soil Sampling Tube..... 26
Hoofs of Horse, Models..... 80
Horn Spoons 164
Horse Hair Sieve..... 95
Horse Measure 79
Horse Score Cards..... 79
Horses, Models 80, 82
Horticultural Hygrometer 109
Hose and Nozzle for Sprayer..... 101
Hot Plates 151
Hydrometer Jars 92, 152
Hydrometers 92, 102, 189
Hydrostatic Cream Balance..... 90, 126
Hygrometer 109
Hypsometer 75

I

Ignition Tubes 167
Increment Borers 76
Insecticides 102
Insects, Life Histories.....103, 104
Intestinal Canal of Horse, Model..... 80
Intestinal Canal of Ox, Model..... 81

INDEX—Continued

J

PAGE

Jars....27, 90, 92, 152, 171
Jar with Drainage Outlet.... 22
Jelly Tumblers 171

K

Kekulé's Water Level.... 193
Kidney of Ox, Model.... 81
Kidney of Horse, Model.... 80
King's Soil Sampling Tube.... 26
Kjeldahl's Apparatus 41, 42
Kjeldahl's Flasks 43, 148, 192
Knapsack Sprayer 99
Knife, Killing 189
Knives, Budding and Grafting.... 71, 72
Knives, Pruning 69, 71, 72
Knorr's Extraction Apparatus.... 64

L

Labels, Gummed 152
Labels, Plant and Tree.... 52
Laboratory Aprons and Sleeves.... 119
Laboratory Balances 123
Lactometers 92
Lamps, Alcohol 153, 192
Lamps, Blast 132, 133
Lamp Caps 153
Lamp Wicks 153
Lamp Wick Holders.... 153
Lantern Slides 111-118
Larynx of Sheep, Model.... 81
Lead Dishes 146
Lead Shot 78
Lead Tubing 43
Legumes 54, 59-61
Levels, Farm Surveying....105, 106
Lever for Removing Sampling Tubes from the Ground 26
Library Paste 171
Life Histories, North American Insects...103, 104
Lime-Sulphur Hydrometer 102, 189
Linen Testers 156
Litmus Paper 167
Litmus Pencils 162
Log Rules 76
Lopping Shear 70, 187
Lovibond's Standard Colored Glasses.... 11
Lung of a Ruminant, Model.... 81

M

Magnifiers 156
Mallet 73
Marine Glue 171
Market Cream Score Cards.... 95
Marschall Testing Outfits.... 96, 97
Mason Fruit Jars.... 171
Matches, Swedish Safety.... 171
Maul 39
McCall's Aspirator 6
McCall's Capillarity Tube 36
McCall's Specific Heat Apparatus.... 33
Measuring Chains 188
Measuring Standards 79, 188
Measuring Tapes 76, 79, 107
Mechanical Analysis Bottle.... 8
Mechanical Shakers 28, 29
Medicine Droppers 162

PAGE

Metal Bolting Cloth.... 30
Meteorological Instruments 108, 109
Metric and English Pocket Tape.... 79
Metric Linen Pocket Tape.... 79
Micrometers, Eyepiece 156
Micrometer, Stage 156
Microscopes 154-156
Microscope Slides 110
Milk Analysis Apparatus.... 85-98
Milk and Cream Testers....85-87, 190
Milk Balances 126
Milk Dishes 91, 146, 192
Milk Fever Apparatus.... 84
Milk Jars 90
Milk Pipettes 93
Milk Record Charts.... 126
Milk Scales 95, 126
Milk Test Bottles.... 88
Milk Test Traveling Outfits.... 87
Milk Tester Repairs.... 187
Milk Testers 85-87, 93, 190
Millet Samples 53, 59
Mills, Ball 18
Mills, Grinding and Pulverizing.... 18-20
Mimicry in Insects.... 104
Miscellaneous Supplies 170, 171
Models of Cows.... 81
Model of Germination.... 44
Models of Hogs.... 82
Models of Horses.... 80, 82
Models of Oxen.... 82
Model of Propagation 66
Models of Sheep.... 82
Models of Thoroughbred Animals.... 82
Mohr-Geissler Potash Bulb.... 21
Mohr's Burettes 139, 191
Mohr's Clamps 143
Moisture Absorption Apparatus.... 5
Moisture Equivalent Centrifuges.... 10
Moisture Test, Ames.... 96
Moisture Test Balance.... 127
Moisture Testers 47
Moisture Tester Accessories.... 47, 185
Molds for Plasticity Apparatus.... 23
Mortars 153
Moss, Sphagnum 62
Motors 28
Mounting Materials for Seed Specimens.. 187
Mounts, Entomological 104
Muffle Furnaces 17
Muffles 17
Mulch Cylinders 21

N

Nessler's Jars 152
Nets for Blast Bellows.... 132
New York State Lactometer.... 92
Nitrogen Determination Apparatus.... 41-43
Nitrometer 43
Nozzles for Sprayers.... 102

O

Oats, Samples 58
Oats Score Cards.... 62
Oblong Telescoping Sieves.... 185
Oil for Moisture Testers.... 185

INDEX—Continued

PAGE

Oil Measuring and Grain Separating Device 185
Oldberg's Percolators 23, 162
Organic Matter Determination Apparatus. 21
Organic Matter Jar 22
Organic Matter Tube 38
Ovens, Drying 157-161, 193
Over-sleeves 119
Oxen, Models 82

P

Pans 22
Paper, Carborundum and Emery 171
Paper, Fat Free 92
Paper, Filter 147
Paper Flower Pots 51
Paper, Litmus 167
Paper, Sand 171
Paper Tags 52
Paraffine Candles 170
Paste 171
Pasteur-Chamberland Filter Tube 16
Pasteurizing Outfit 92
Pasteurizing Thermometer 98
Pathological Slides 110
Peas, Samples 60
Pellgot Potash Tube 21
Pencil Brushes 138
Pencil, Blue 162
Pencils, Drawing 171
Pencil, Litmus 162
Penetrometer 22
Percolation Apparatus 23
Percolation of Air Tube 38, 40
Percolation of Water Tube 38, 40
Percolators 23, 162
Perforated Bottom 37
Perforated Cards 187
Pestle, Rubber 23
Picture Wire 171
Pinch Cocks 143
Ploscope 93
Pipettes 89, 93, 162, 193
Plant Disease Collection 186
Plant Food 62
Plant Labels 52
Plasticity Apparatus 23
Plates, Germinating 45
Plates, Glass 162
Platform Scales 128
Pneumatic Troughs 168
Pocket Magnifiers 156
Pocket Tapes 79
Porcelain Balls 18
Potash Bulbs and Tubes 21
Potassium Hydrate Flask 21
Potato Score Cards 62
Poultry Instruments 84, 189
Preservatives 93
Propagating Knife 72
Propagating Sand 62
Propagation Chart 66
Pruning Tools 67-72, 187
Puddling Tray 35
Pulverizing Mills 18-20
Pumps, Filter 147

Q

PAGE

Quartz or Fused Silica Ware 145, 146
Quevenne's Lactometers 92

R

Rack for Test Bottles 93
Raffia 73
Reagent Bottles 136, 137
Receivers 162
Recording Thermometers 184
Refractometers and Accessories 94
Rennet Test 97
Repairs for Milk Testers 187
Retorts 162, 163
Retort Adapters 163
Retort Receivers 162
Retort Stands 165
Ribbed Funnels 149
Rice Samples 60, 61
Riders 130
Riker's Mounts 104
Rings, Iron 163
Ring Stands 165
Root Growth Box 44
Rubber Aprons and Sleeves 119
Rubber Bands 171
Rubber Cement 171
Rubber Discs for Bellows 132
Rubber Gloves 151
Rubber Pestle 23
Rubber Sprinklers 46
Rubber Stoppers 163, 185
Rubber Tubing 164
Rules, Board and Log 76
Rye Samples 60, 61

S

Safety Matches 171
Salt Test for Butter 97
Sample Carrying Outfit 27
Sample Bottles 90
Sample Boxes 27
Sample Jars 27, 90
Samplers, Grain 193
Sampling Cloth 26
Sampling Tubes 26, 36, 183
Sampling Tube Hoist 26
Sampling Tube Brush 26
Sand 62
Sand Baths 164
Sand Crucibles 145
Sand Paper 171
Sawdust 62
Saws, Pruning 68, 69
Scales 120-128
Schellbach's Burettes 191
Schiff Nitrometer 43
Scoops 8, 164
Score Cards, Cattle 79, 95
Score Cards, Dairy 95
Score Cards, Eggs 84
Score Cards, Grain 62
Score Cards, Horses 79
Screw Cap Jars 27, 90
Screw Compressors 143
Sealing Wax 171

INDEX—Continued

	PAGE
Sectional Capillarity Tubes	37
Sediment Tester	97
Seeds of Farm Crops and Weeds	53-61, 186
Seed Culture Apparatus	44-65
Seed Mounting Materials	187
Seed Scale	50
Seed Test Balance	127
Seed Testers	48, 49
Separatory Funnels	149
Shakers	28, 29
Shears, Pruning	67, 70
Sheep, Models	82
Sheep Score Cards	79
Shot, Lead	78
Shrinkage Apparatus for Soils	183
Sieves	30, 31, 49, 95, 185
Sieve Shaker	29
Sieve Without Bottom	30
Silk Bolting Cloth	30
Skim Milk Test Bottle	88
Sleeves	119
Slide Binding	187
Slide Cover Glasses	187
Slide Rule or Scale, Richmond's	95
Slides, Microscope	110
Soil Acidity Tester	33
Soil Analysis Apparatus	5-43
Soil Auger Field Sets	25
Soil Augers	24, 183
Soil Balance	124
Soil Bins	7, 8
Soil Boxes and Cans	5, 22, 27
Soil Carrier	27
Soil Centrifuges	9, 10, 190
Soil Conductivity Bridge	32
Soil Fertility Apparatus and Supplies	44-65
Soil Pans	5, 22
Soil Sampling Tubes	26, 183
Soil Sampling Tube Hoist	26
Soil Shrinkage Apparatus	183
Soil Sieves	30, 31
Soil Thermometers	35
Soil Tubes	37-40
Soil Tube Auger	40
Solder	171
Solid Flame Burner	140
Solution Scales	124, 128
Sorghum Samples	60
Soxhlet's Extractors	63, 192
Soxhlet's Drying Ovens	158
Spatulas	164, 193
Specific Gravity Tubes	39, 184
Specific Heat Apparatus	33
Specimen Mounts	104
Spence's Lactometers	92
Sphagnum Moss	62
Splints	171
Sponges	171
Spoons	164
Sprayers	99-102
Sprayometers	102, 189
Spring Board Compactor	12
Sprinklers	46
Sprouting Apparatus	46
Sprouting Cup	45
Sprouting Media	62
Stage Micrometer	156
Standard Colored Glasses, Lovibond's	11
Steam Baths	169
Sterilizer Bottles	28
Sterilizing Outfit	92
Stirring Rods	96, 97, 150
Stomach of Ox, Model	81
Stomach of Sheep, Model	81
Stop Cocks	165
Sulphur Determination Apparatus	185
Sulphuric Acid	87
Supply Tank	40
Support, Aspirator	6
Supports for Soil Tubes	38
Support Frame for Soil Tubes	37
Supports	165, 166
Supports, Test Tube	166
Surface Soil Tubes	39
Surveying Compasses	75
Surveyors' Chain Tapes	106
Surveyors' Arrows	107

T

Tablets, Alkaline	96
Tablets, Corrosive Sublimate	93
Tags, Brass	171
Tags, Paper	52
Tank Sprayer	100
Tanks, Water	15, 34
Tape, Grafting	73
Tapes, Measuring	76, 79, 107
Tapes, Surveyors' Chain	106
Tapers, Wax	171
Teeth of Horse, Models	80
Tenacity of Soils Apparatus	34
Test Bottles	88
Test Bottle Rack	93
Test Bottle Testers	98
Test Paper	167
Test Tubes	98, 167
Test Tube Brushes	138
Test Tube Clamps or Holders	142
Test Tube Supports	166
Text Books	172-182
Thermal Conductivity of Soils	13
Thermometer, Automatic Alarm	103
Thermometers, Chemical	167
Thermometers, Dairy	93
Thermometers for Moisture Testers	183
Thermometer, Pasteurizing	93
Thermometers, Soil	35, 183
Thermometer, Veterinary	83
Thermometer, Wollny's Refractometer	93
Thermo-Regulator	157
Thistle Tubes	156
Tongs, Crucible	168, 193
Torsion Balances	125, 127
Towelling, Crash	17
Tracing Cloth	17
Tractor Sprayers	100
Tray, Color	3
Trays, Drainage	3
Trays, Germinating	4
Tray, Puddling	3
Trays, Water	3
Tree Calipers	74